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A Practical Approach to Risk Management

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Abstract

The following paper by Dr. Vincent Kaminski will examine the current state of the energy industry and the challenges it is facing. This paper explores the growing need for risk management platforms for companies who participate in energy trading. The need is more pronounced than ever before, given record market volatility, changing regulatory requirements and the increasing globalization of the energy marketplace.

Dr. Kaminski is an authority on quantitative analysis and risk management in the energy industry. He has more than sixteen years of experience working with many of the world's most renowned companies, including Citigroup, Sempra Energy Trading, Reliant Energy, Citadel Investment Group, Enron and Salomon Brothers. Dr. Kaminski is a professor at Rice University's Jesse H. Jones Graduate School of Management, where he teaches energy finance and energy derivatives. He has published a number of papers and books, and speaks regularly on the energy market industry.

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Introduction: The socioeconomic tug-of-war

Energy will be one of the defining challenges facing every society in the years to come. The struggle between demand and supply results in prices spiking and crashing - volatility that is very high compared to the financial markets and likely will only increase.

Although most of the world's population consumes energy fairly frugally today, the consumption of energy per capita varies widely from country to country. A citizen of Bangladesh consumes only 2% of the energy consumed by an average American. A human can be compared, in terms of energy consumption, to a 100 Watt bulb. A member of a highly developed post-industrial society living in North America is the equivalent of an 11,000 Watt bulb. However, the majority of humanity still tends to be closer to the lower end of the energy use spectrum.

Simultaneously, we are hitting the supply limits of cheap conventional sources of energy commodities, and finding that harnessing non-conventional sources of energy presents formidable technological challenges, related to the cost and quality of produced energy. For example, wind energy, though widely available, has obvious intermittency problems and huge environmental impact.

Another salient feature of modern energy business is the growing importance of energy trading, often carried out by sophisticated companies with a global presence. Without exaggeration, one can say that the sun never sets on many energy trading companies. As the trading books are passed around the globe, the business touches multiple cultures, regulatory and legal regimes, national interests, and aspirations. Energy trading is currently dominated by a relatively small group of players (big commercial and investment banks, oil firms, hedge funds), and increasing competition, in many cases, is disruptive to the established price patterns, existing business practices, and strategies.

These social and economic forces will continue to shape modern energy markets, posing formidable IT challenges to risk management in the energy industry. The problems that need to be addressed include imperfect tools and algorithms, and a shortage of well-trained and experienced risk managers. One very difficult task is finding an efficient way to support the business entity, while maintaining necessary separation of duties and organizational autonomy.

Effective risk management will become even more complex and challenging, yet it will be a critical precondition of profitability and growth, both for the producers and end users of energy.

The future U.S. energy sources

The United States faces the task of reducing dependence on traditional sources of energy, spurred by national security concerns, global warming and environmental considerations, and the peaking supplies of conventional energy.

Development of new sources of energy will require massive mobilization of human and financial resources, which will be a challenge in a tight economic climate. Although existing alternative sources of energy are available, they require the industry to overcome energy quality and cost issues.

Until the U.S. surmounts these obstacles, we are likely to have periods of increasing prices. Eventually, as market forces and technological breakthroughs increase supply, price increases will be followed by periods of falling prices.

Overall, a successful American transition to new energy sources will depend on efficient markets sending correct price signals to both the end users and producers of energy. This system will optimize the use of energy sources and the development of different energy saving technologies.

The task we are facing is finding viable solutions to these unprecedented challenges. It is my deep conviction that these objectives can be accomplished only in the context of the market system

that creates not only individual and institutional incentives, but also directs resources to the most efficient uses. The silver lining of this challenge is that it translates into career opportunities with a great potential not only for wealth formation but also for individual self fulfillment for all Americans.

Globalization

The evolution of the U.S. energy market can only be understood in the context of increasing globalization, which means that local, isolated, national markets will mutate over time into one market connected through different links and business processes.

What happens in mature markets like the U.S. and Japan will influence the market trends in developing nations. We already have evidence of this effect in global trading of carbon dioxide emissions and crude oil.

With globalization, local companies will depend increasingly on people and resources from other countries. We will be dealing with a much more diverse customer base and a mix of employees. At the same time, mergers and acquisitions will lead to the emergence of companies conducting activities in many countries and segments of the energy complex.

These developments will eliminate many of the national and cultural differences in business activities, as well as increase the risks. Shocks will become a norm, transmitted rapidly across different regional markets and sectors of the energy chain. The channels of transmission will constantly evolve and be influenced by economic, political, and technological developments.

Effective risk management that allows companies to absorb these shocks will be critical to the energy market, profitability and growth for producers, and mitigation of price volatility for end users.

Integration

The formerly distinct markets for separate energy commodities are being transformed into one Energy market, with complex, evolving links.

One of the important links connecting natural gas and oil markets is the international merchant liquid natural gas business. LNG in many markets is indexed to oil but we can see more and more frequently contracts with prices determined through netback to Henry Hub. At some point we can expect the emergence of an international market for CO2 emissions. One also cannot forget that all the sectors of the industry depend on the same inputs, labor pools, and know-how.

A new mix of players

When I started in the energy business in the early 1990s, the field was dominated by a few merchant energy companies.

Ten years later, the picture has changed dramatically. A new class of players has emerged that includes big financial institutions and hedge funds. We are also witnessing a growing interest of the institutional investors in the energy markets. Energy commodities are seen as a hedge against inflation risk and geopolitical risk.

The consequences

These diverse players with varying objectives, constraints, and access to capital will make operating in these markets difficult. Energy prices will become more volatile, fluctuating intraday and over short periods. We see this already with oil prices jumping \$10 in a single day. Generally, prices will trend upward, primarily due to demand from developing nations.

In response, one can expect a backlash from residential and commercial customers, who often perceive cheap energy as an entitlement. Governments will react by turning up the regulatory pressures, adding cost to every participant in the supply chain.

Financial and risk implications

Under these conditions, we will be exposed to much higher credit risk and operating under conditions in which the credit ratings of our counterparties, suppliers, and customers can change overnight. The assessment of quality of credit will become increasingly difficult as the complexity of the credit problems keeps rising.

Take one recent example, Constellation Energy. Constellation issued a report on March 31, 2008, showing its collateral needs in the case of a credit downgrade. The number that Constellation reported to the investors was dramatically revised a few months later, and in a few weeks the company was forced to agree to an acquisition by a stronger partner.

What is important is not that this happened, but that it happened so quickly and the company itself was not aware of the challenges it was facing.

The skills and knowledge gap

Globalization and integration at this pace mean that our industry must reinvent its tool box. Trading will require a unique combination of knowledge and acquired skills. First, one will have to understand the physical layer of the industry: the technology and the infrastructure behind production, distribution, and storage of energy commodities.

In addition, companies will have to develop very solid financial engineering skills and understand the institutional and geopolitical framework of the energy markets.

Today, most business schools do not understand the complexity of the skills required in this area. They produce graduates with a general understanding of business, rather than offering comprehensive energy-related programs required to support modern energy markets.

New graduates learn the skills related to energy finance, trading, and risk management on-the-job. Companies hire fresh graduates with different skills and face the task of forging them into a viable team.

In many cases, a deep gap remains between the skills and the language of professional groups. Energy professionals know the minutiae of the energy market, including assets, production technologies, and the regulatory framework. Energy quants tend to think using highly stylized and abstract systems and don't like dealing with messy problems or imperfect, low quality data. Computer programmers have limited industry knowledge and, often, poor communication skills or language barriers.

Enter the risk management group

The challenge companies are facing is how we can bring together these professionals with different skills and make sure that they work in an effective way. The natural hub that brings professionals with unique backgrounds together and allows them to interact and develop a coherent framework is a risk management group.

Creation of specialized corporate units responsible for risk management is an important development in the management practices of modern financial and industrial companies.

I define enterprise-wide risk management as “a systematic and disciplined process of identification, measurement, reporting and mitigating risks across all business units and company operations using a unified and conceptually coherent framework.”

Formal quantitative models to assess risk represent one of the greatest intellectual revolutions of the 20th century. They made risk management possible.

The problem is that the promise of risk management remains unfulfilled. Some would argue that the advances in risk management and financial engineering have made the world a more dangerous place, as our fixation on imperfect models and single numbers lead us to measure aggregate risk in a myopic way.

In addition, formal bureaucratic processes sometimes dominate substance. Many individual organizations don't empower risk managers by giving them effective influence over the decision making process and the ability to stop a bad deal in its tracks. These failures may have catastrophic consequences for an organization, as proved beyond a doubt by the current financial crisis. The field is littered with examples of embarrassing fiascos.

Often, we are missing a critical link: a stable and scalable IT platform.

The risk management process

Before we get to the discussion of the critical features of an effective information technology platform, we should look at the nature of the risk management process.

The risk management process requires involvement and cooperation of many different corporate units, which often have different reporting lines and stated objectives and see involvement in the process as a distraction.

Risk management organization

In many financial institutions, risk management technology is years behind the business processes. The fast pace of financial innovation makes risk management models obsolete and upgrades years late. It is not unusual for risk management models to be five years behind business practices.

This lag is understandable. We see very strong pressure coming from the commercial people to start and grow operations for trading and marketing of energy commodities. The development of the information technology platforms, including risk management, is often a second or third priority.

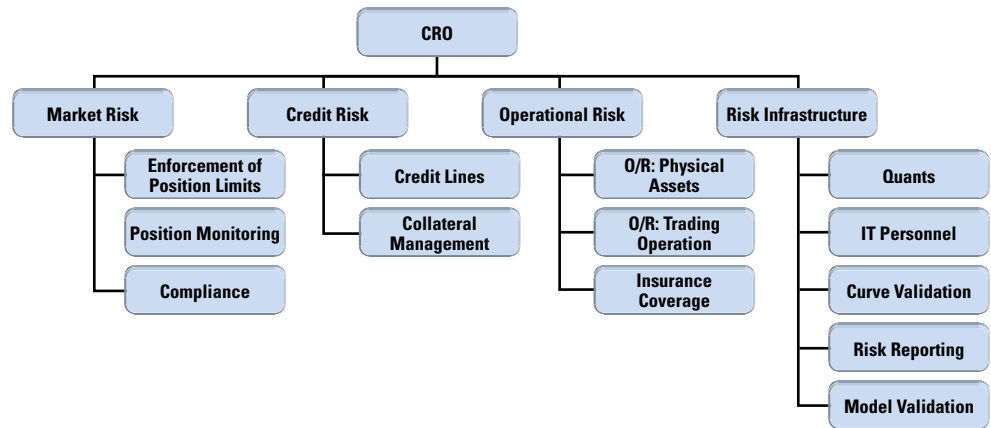
Not only are models outdated, the input data is old and imperfect, for two reasons. Updating inputs requires a massive exercise in data collection and processing, so updates often only occur on a quarterly basis.

In addition, the scale and global scope of modern financial and energy companies requires taking measures to reduce the dimensionality of the problem. This is quite understandable. Reporting

risks at the company level, generating value-at-risk numbers for example, requires making numerous assumptions and simplifications. For example, trading positions in jet fuel, heating oil and resid can be converted into oil equivalent positions. Once you start mapping one set of commodities into another, information is effectively lost. In the process, risk management systems become very powerful information destruction machines.

The diversity and personalities of the people involved in the process come into play as well.

When you look at this chart representing the organization of the chief risk officer (CRO), you see an astounding diversity of problems the organization must solve, with an astounding variety of skills, and an astounding demand for data.



Quants are usually introverted individuals who derive satisfaction from developing quantitative models, not from interaction (and confrontations) with traders. They often demand specialized tools, and refuse to recognize the need for standardization. In one group I was managing, every quant wanted to use a different software package and software language.

In turn, traders know that the most significant trading benefits result from the ability to review trading positions across multiple dimensions in a short period of time. Every trader has his own preferred source of data inputs and his preferred way of reporting the portfolio positions.

Traders see existing quantitative models that depend on predefined data structures and esoteric models as risk management straightjackets.

These different constituents with their unique data demands define the objectives of an effective risk management system: having an information technology platform capable of efficiently capturing, processing, and reporting all relevant information.

The importance of IT systems

An energy trading software platform must be flexible and able to evolve together with the energy markets and the changing nature of the business. It's less important to satisfy every whim of a trader and or a commercial person. They typically want to have all sorts of different features, often of very minor importance from the point of view of the entire business, but usually taking a lot of effort to implement.

We should note that a robust, well designed IT platform does not necessarily translate into effective risk management. A poor IT platform, however, guarantees major risk management disasters.

The IT challenge

So what should IT do? Historically, risk management has been a low priority in the development and installation of software systems. The main objective is to get the trading business going. With the pressures and volatility in the energy market, IT needs to change the dynamics quickly in order to avoid embarrassing fiascos, and, potentially, major catastrophes.

IT teams should evaluate their IT platform with an eye to several critical risk management functions:

- » a holistic representation of risks,
- » integration of trade processing,
- » integration of downstream systems with corporate systems, and
- » efficient links between technology, processes, and people.

Complete representation of risks

Typically, platforms used in energy trading and risk management have evolved from two types of systems, those used for handling physical flows of certain commodities, such as coal and oil, and those for financial systems trading bonds and equities. The first system is adept at handling the logistics of different types of physical products. The financial system is optimized for capturing risk profiles of different portfolios. Both of these types of systems have been adapted to support energy trading by adding specialized modules, making them reminiscent of homes after extensive, but not always careful, remodelling.

Unfortunately, few systems offer a reasonable compromise between different types of objectives. To support fundamental business operations, many companies are forced to use multiple platforms, which creates major integration issues.

These business requirements are not going away. In fact, accurate assessment of risk will add to the data integration burden, so we need to build systems that facilitate this integration and comprehensively organize information about different types of risks.

Integrated trade processing

Integrated trade processing represents the second crucial attribute of an effective IT platform for energy trade. We are in a business that is very labor intensive, because our market, while global and integrated in terms of shock transmission, is at the same time fragmented in terms of rules, procedures, regulations and interfaces between different markets.

For example, power pools in each regional market have different norms, conventions, and regulations. The system must capture the specific features of the power pools of each local market.

Overall profitability of a trading operation depends on the ability to process trades seamlessly across different parts of the trading operations (front, mid and back office).

The problem is that many companies have separate systems supporting many distinct types of trades. Crude trades executed in the financial market may be supported by one system. Physical crude trades may be processed using another system. To bridge this gap, we have a large group of people moving data manually across these systems using spreadsheets, often designed ad hoc.

This situation must change. Spreadsheet-resident transactions are prohibitively expensive and often represent huge potential risks. More and more, we see that decisions made in one group can

affect another group or the entire company by creating huge overhead costs and potential for costly mistakes.

Integration of downstream systems with corporate systems

No trading or risk management operation resides in a vacuum. We must move to a system that allows for simultaneous processing of transactions across many different operations, starting with the trade execution through risk management, and to the back office. Energy trading should be integrated with corporate systems such as credit, treasury, and invoicing.

This system works well, and is easier to achieve, in pure financial companies or pure physical commodity firms with a well-defined business profile.

Heterogeneous businesses confront a more challenging task because the business profiles are so diverse. If you are operating inside a hedge fund, you might also have some physical-related energy capabilities. Sometimes it is necessary to take a futures contract to physical delivery to avoid a short squeeze or due to limited market liquidity. A risk management system must accommodate this flexibility, but still calculate and deliver information required for making a decision quickly and appropriately.

The critical links

So what are the critical links that make risk management possible? The implementation of risk management systems must focus on effective, efficient links between technology, processes, and people. A good IT platform should be combined with efficient design of the business processes that define risk management. Your mathematical algorithms must be correct, your models must be accurate, and these two things can only be effective in practice if they are used in the context of well defined and seamless business processes.

The goal is to avoid risk management breakdowns due to human error or failure to follow established procedures.

At one point in my career, my team spent three weeks trying to figure out what was going wrong with a value-at-risk system. What we eventually found was somebody in England went for a vacation in Scotland and forgot to mark his trading book as mark-to-market as of a certain day. The flag in the database wasn't changed. The person was probably in a hurry to catch his flight, and it cost a big group of professionals three weeks of effort. It was one of the most expensive vacations in the history of energy trading.

Of course, a successful system includes a key component: people with the right skills who are empowered to act. The right people can understand trading, risk management and the IT technology. Finding such people is probably the most important key to having a successful risk management business.

Conclusion

Given what is going to happen in the energy market - the supply and demand pressures, globalization, and integration - every company will need efficient risk management. A scalable and stable IT platform and the right combination of people, processes, and technology will be critical, not just for performance, but also for survival.



Allegro Energy Trading and Risk Management Solutions

Allegro energy trading and risk management (ETRM) software delivers the fastest realization of business objectives and greatest flexibility with minimal risk and disruption. Allegro delivers agile ETRM solutions to power and gas utilities, refiners, producers, traders, and commodity consumers worldwide. The Allegro 8 enterprise platform drives profitability and efficiency across front, middle, and back offices, while managing the complex logistics associated with physical commodities. Today more than 3500 users rely on Allegro to manage trading, risk management, physical logistics, and regulatory compliance across their portfolios in gas, power, coal, crude, petroleum, emissions, and other commodity types.

Allegro's advanced software architecture and component-based approach allow Allegro to rapidly deploy agile solutions to perfectly match customer priorities and deliver a high return on investment. The key to implementation success is that every effort centers around a specific business objective. This focus minimizes the number of specific business processes involved in achieving the objective. It also minimizes the number of technology changes required and minimizes the number of personnel affected. The result of all these steps is a faster realization of business objectives for our customers, better cost/benefit alignment, and higher total benefits over time.

Allegro solutions help companies:

- » **Improve Position Analysis and Valuation** - Make better business decisions with accurate and instantaneous views of positions and valuation
- » **Improve Trader Productivity** - Streamline and automate trade processes to reduce the risk and cost of dual-entry and manual processes to allow maximum attention to profitable opportunities
- » **Manage Market Price Exposure** - Mitigate exposure to volatile market prices with effective hedging and real-time updates, comprehensive metrics, and simulation
- » **Manage Counterparty Exposure** - Mitigate exposure with credit and collateral management, and a flexible credit scoring process
- » **Manage Liquidity Exposure** - Manage cash and capital adequacy with efficiency
- » **Achieve Hedge Accounting Compliance** - Manage compliance with accuracy and confidence

About Allegro

Allegro is a global leader in energy trading & risk management solutions for power and gas utilities, refiners, producers, traders, and commodity consumers. With more than 27 years of deep industry expertise, Allegro's enterprise platform drives profitability and efficiency across front, middle, and back offices, while managing the complex logistics associated with physical commodities. Allegro provides customers with agile solutions to manage risk across gas, power, coal, crude, petroleum, emissions, and other commodity markets, allowing decision makers to hedge and execute with confidence. Headquartered in Dallas, Texas, Allegro has offices in Calgary, Houston, London, Singapore and Zurich, along with a global network of partners.

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