

Practices for Risk Assessment and Control in the Brazilian Electricity Market: state of the art

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SUMMARY

CIGRE Study committee C5 in Brazil created in 2014 a working group to focus on risk management practices. This paper analyses the results of a survey done in 2015, that intended to discover the current status of risk assessment and control practices in the commercialization of electricity in Brazil. This working group intends to outline some of the best practices in this area and contribute to the sustainable development of the Brazilian Electricity Market. As many risk factors are involved in this industry, we focused on market risk specifically as it was of particular interest to the group.

Within the Brazilian Electricity Market, we find various different approaches and perceptions of what market risk represents and in the assessment methodologies used by its active players, mainly due to the existence of many risk factors to which they are exposed that can be classified as market risk, and to the particular regulatory and operational characteristics of this market. One important contribution of this work to the local market was to outline a consensus reference of which risk factors are involved in risk management and which alternative methodologies and tools are commonly used in the processes of calculating these risks locally.

The survey contained questions on current risk assessment and control internal structure, aversion, policies, methodological approach, technology and control requirements. It was sent to more than 100 of the main market players, to which we received 32 complete and valid answers from public and private companies that conform a very good representation of this local power market.

The results of this survey gives us a good idea of the status and ongoing developments in risk assessment and control within the Brazilian Electricity Market. By analysing the responses to the survey we were also able to present some very interesting conclusions and interpretations of the local risk management activity, and to make some interesting comparisons with other international markets. For example, the fact that regulatory and market risk are the two main risk categories most companies are concerned about, as they have indicated that important losses in these aspects have already been accounted for.

KEYWORDS

Brazilian Electricity Market, Market Risk, Risk Management, Survey

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1. Introduction

Risk assessment and control is a very relevant and always evolving aspect of any economic activity, and particularly in the Electricity Markets it has become a central issue for companies acting in competitive and unregulated markets. In the case of Brazil where hydro generation is predominant, price volatility and dependency on climate factors makes risk assessment and control a very significant and challenging aspect of the business for all players.

The Brazilian electricity market has peculiar elements on its design that makes it different from the European or US markets. As in all other Latin American countries – except Colombia – in Brazil the system dispatch is not bid-based but cost-based and centrally managed by an ISO, who makes dispatch decisions to coordinate the hydrothermal scheduling based on stochastic optimization models. The energy spot price – calculated weekly, ex ante and for four zones and three load blocks – is a byproduct of the model. The dispatch model is publicly available to all market participants – in an effort to increase transparency – and energy prices are very volatile. There is an active forward market and the contracting level in the system is fairly high. In order to ensure supply adequacy, it is required that all contracts should be backed by firm energy certificates by the seller, which are tradable. For a more detailed description of the market we refer the reader to [7,8].

Risks can be divided in several categories where market risk, regulatory, credit and operational are the main categories for energy companies. The main focus of the survey was to discover the state of the art and understand the practices for the market risk category principally, as we desired to identify best practices and offer a road map or benchmark for companies to work on.

Currently, approximately 73% of the Brazilian Electricity Market (BEM) is defined as the Regulated Market (ACR) where captive consumers (residential and industrial) buy their energy from their local distribution company at tariffs defined by the regulatory agency (ANEEL), and where the energy purchase for this market is done by a series of periodic auctions organized by a government entity (EPE). The other 27% of the market defined as the Unregulated Market (ACL) operates in a similar way to other international markets in Europe and North America where generators, traders/brokers (commercialization) and large enough industrial consumers interact buying and selling energy to manage their energy portfolios in order to maximise their results and attend to some basic regulatory requirements. Companies that act in this Unregulated Market are the particular interest of our paper as they are generally exposed to market risks and need to have an internal structure that understands, measures and manages these risks.

Within the BEM, we find various different approaches and perceptions of what market risk represents and in the assessment methodologies used by its active players, mainly due to the existence of many risk factors to which they are exposed that can be classified as market risk, and to the particular regulatory and operational characteristics of this market. When preparing our survey to the specific reality of the BEM we tried to standardise some concepts so that a comparison with other international markets would be possible.

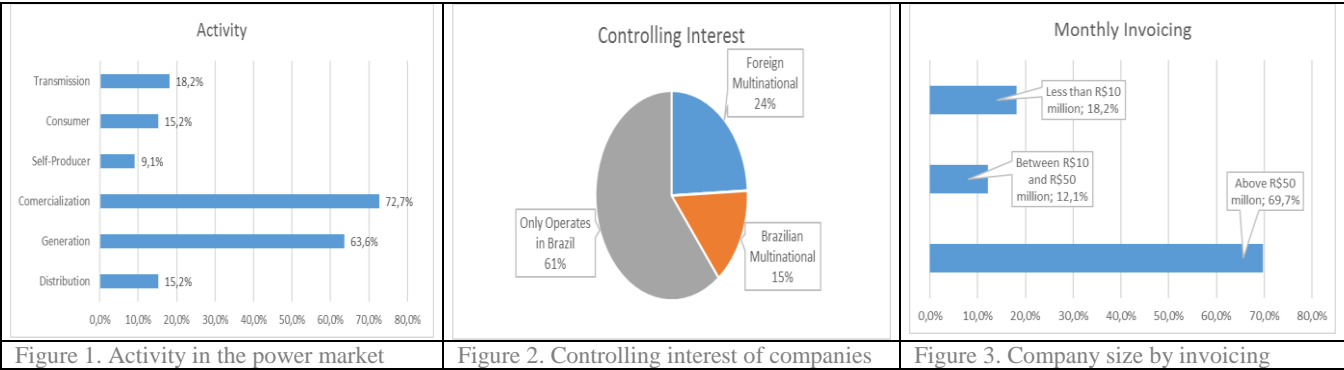
In the next section of this paper we present the scope and intention of our survey, how and to what companies it was sent to, and present the characteristics of the respondents and how they represent the BEM. Then we present a summary of the results with some analyses obtained by correlating the answers each company gave. We then compare some of this information with international references and finalize with some conclusions and further developments of this work.

2. Survey and Respondents

The survey questions were based on other international surveys [1 to 4] and papers [5] and adjusted to attend to the local markets particularities. The questions were divide and structured to (i) classify in accordance the respondents company's size, activity and controlling interests, (ii) determine risk

aversion and the internal structure and organization for risk reporting and control, (iii) discover the relevance and perception of different risk factors, and (iv) understand what approach, methodologies, practices and assessment and control tools are being used in these companies. The final survey was composed by 30 questions and was delivered through a specialized electronic survey platform during the months of May and June of 2015. Links to the survey were sent to representatives of over 100 companies that participate in the unregulated market and were identified as active market players and knowledgeable of risk management issues. This includes principally generators, trader/brokers, large industrial consumers and companies with distribution and transmission activities included. A total of 32 complete and valid answers were received, and these companies that participated can be considered as very good representation of the BEM.

In figure 1 we see that many companies participate of various activities and that most companies have generation and/or trading/brokering (commercialization) as part of their business. A relevant proportion of the respondents are foreign companies or Brazilian multinationals but the majority operate exclusively in Brazil as demonstrated in figure 2. As for the size of these companies, figure 3 shows they are big companies in most cases as almost 70% have over R\$50 million reais invoicing each month (more than 16 million dollars per month at that time).



Half of these companies have their stock listed in some exchange, where 15.6% are listed exclusively in Brazil, an equal 15.6% are listed only in exchanges outside of Brazil and 18.8% have them listed locally and abroad.

3. Survey Results and Analysis

3.1 Risk Aversion

Two thirds of the respondents classified themselves as risk averse, while 25% declared to be risk neutral and 9% as risk takers. This risk profile seems to depend on the segment of activities they participate as shown in figure 4, where consumers are mainly averse to risk as well as those that are exclusively generators. On the other hand, those agents that declared to be risk takers are either exclusively commercialization agents or generators with trading activities, as they generally trade or hold open positions seeking an extra profit for their companies.

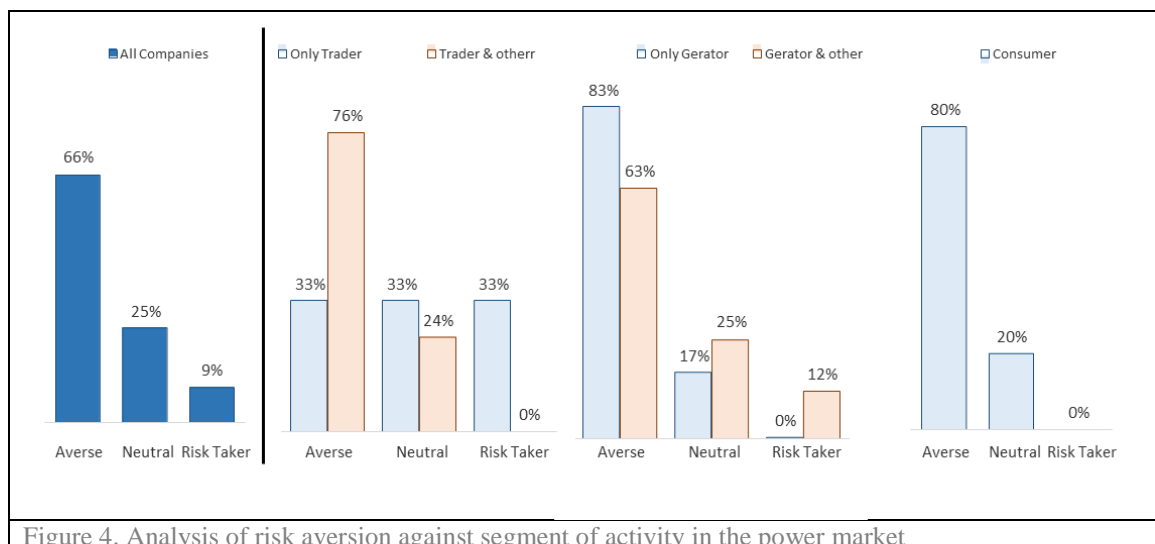


Figure 4. Analysis of risk aversion against segment of activity in the power market

3.2 Internal Structure, Process and Systematization

Analysing the internal structure of these companies we note that 80% have a corporate risk area while this fact is not related to the risk aversion profile. In almost half (46,8%) of the companies the responsibilities of risk management are allocated in a centralized area and in only one case this area is located outside of Brazil. An equal proportion decentralizes these responsibilities and in one third of these cases there is no specific formalization of these attributions, as they are mixed with the normal activities of different areas of the company. An average of 2.5 employees per company are dedicated to calculating and controlling market risk, and in 75% of cases the number is equal or less than four.

One quarter of the respondents are in process of elaborating and approving an internal risk policy, while 63% already have one in place and 80% of these policies specifically treat market risk issues. As for reporting and the responsibility of approving risk, more than 83% indicated the board of directors, and only one quarter indicated to have a specific risk committee responsible for market risk decisions.

Official risk indicators are used by 72% of the surveyed companies, and here we can find those companies with stocks listed in some exchange market and with approved risk policies. This supports the argument that compliance requirements for public companies drives the implementation of risk management best practices. We also observe that 46% of the respondents use risk limit of tolerance.

Specific market risk reports are elaborated routinely in 43% of the companies and in 23% these specific reports are produced only when demanded by management. In 20% of companies the specifics of market risk are reported within other management reports, and no specific reporting is done in 14% of cases.

When it comes to what kind of tools are used to calculate and control market risk, only 19% have acquired analytical tools from specialized external providers, and in 69% of cases these tools have been developed internally within the company. We also note that 35% of cases that developed their tools internally are still in development stage. When asked about their opinion on the degree of systematization in their companies, 60% responded that they consider it low or very low. The reason for this opinion must be because these tools must require a great deal of manual and updating work as 75% of surveyed companies use Excel as their main analytical tool. Only three companies responded that they have a high degree of systematization and their analytical process is executed automatically.

3.3 Risk Perception

Market changes and events in recent years have driven different players to review the way they operate and manage risks associated to their business. The section of questions about risk factors

specifically identified for the local market was driven to understand and classify these risk factors by relevance, if they actually manage these risks and if they have materialized in the past at their company. Figure 5 summarizes the result of this section and presents it in terms of a normalized index (100% to -100%) for each risk factor in the corresponding question, using concept similar to the NPS [6] (Net Promoter Score, Keiningham et al 2008).

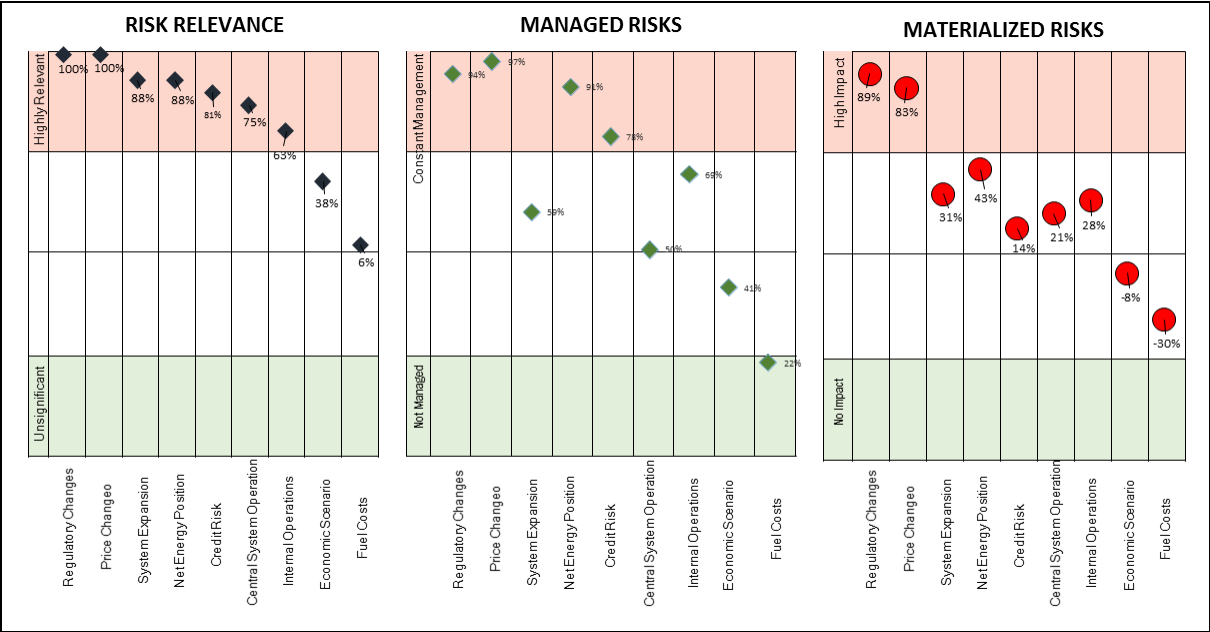


Figure 5. Classification of risk factors/classes by relevance, if managed and if materialized in the past

When it comes to the relevance classification of risk factors we clearly see that 100% of companies consider both Regulatory and Price risks as the most relevant, with a score of over 80% on the impact these two risk factors have caused in the past and that over 95% of companies actively seek to manage these risks. Recent regulatory changes have certainly had important impacts on agents’ economic results and provoked drastic changes in their business strategies. And the high dependency on climate factors due to the hydro generation dependency makes price exposures a very risky aspect of the business in Brazil.

Other also important risk factors outlined in this survey are (i) the overall System Expansion, (ii) uncertainty in Net Energy Position due to embedded flexibilities in contracts and a generation scaling factor (GSF) applied to hydro generators, (iii) Credit Risk and (iv) how the Integrated System (SIN) is operated by the ISO. These risk factors have materialized in the past but only with moderate or low impacts, except for Net Energy Position where recent GSF issues have increased the relevance of this risk factor. Only Net Energy Positions and Credit Risks are managed by more than 75% of respondents.

3.4 Analytical Approach and Practices

The questions about the analytical approach were focused on the quantitative aspect of measuring risk. Scenario analysis is the most common analytical approach for measuring risk in Brazil with over 72% of these companies that use it. Perhaps because it is easily applied using Excel, but on the other hand 70% of companies that use scenario analysis consider they have a low degree of systematization in their company.

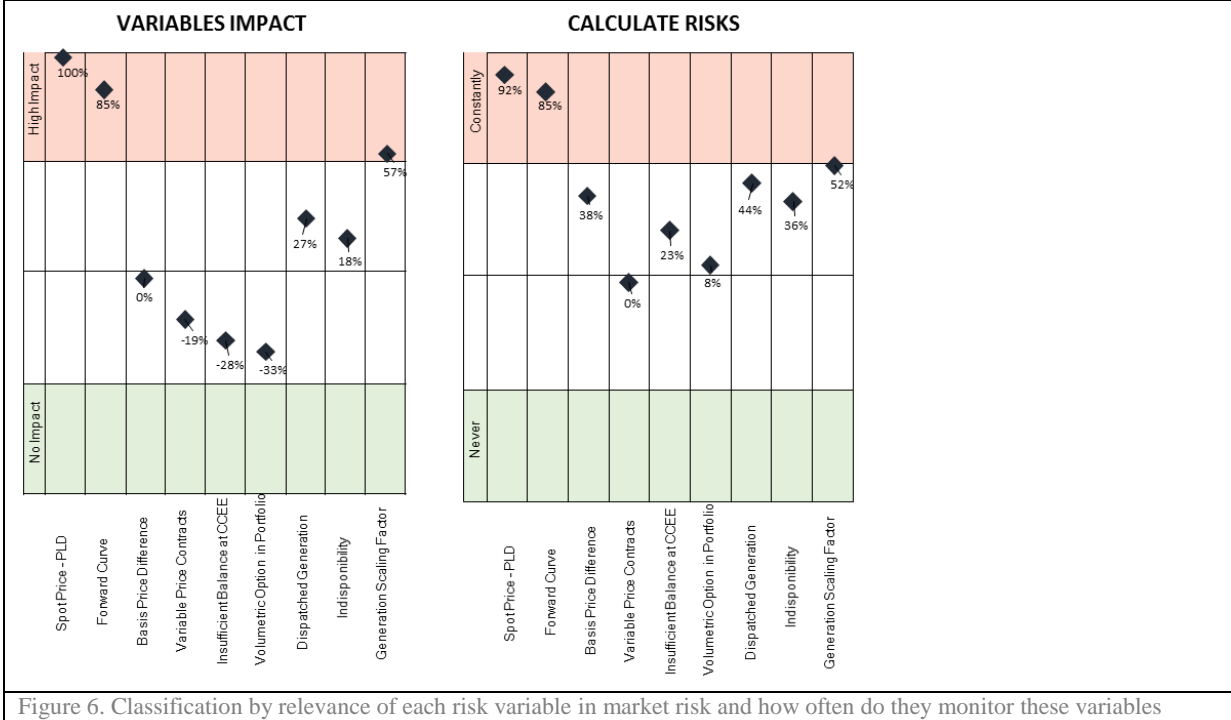
With similar importance we find that the probabilistic approaches, also based on scenarios, either using the value at risk (forward curve) concept (65%) and/or using the cash flow at risk (PLD – spot projections) concept (69%) are very commonly used. Another important point to consider is that 53% of respondents generally use the advice of specialists to support their risk analysis.

Only 50% of all surveyed companies use the concept of mark to market (MtM) to manage price risk in their energy portfolios. Analysing the segment of activity were they act, we find that a larger percentage (65%) of brokers/traders use MtM, while only 50% of generators use it. And when asked about their opinion on their analytical approach to risk assessment we find that 65% of those respondents that consider it good or very good use the MtM concept, while 50% of those that think it needs improvement doesn't use MtM. Overall, 50% of respondents consider they need improvements in the way they analyse market risk.

When it comes to risk mitigation tools or strategies we have 81% of companies that use the forward market to hedge their market risk. Time swaps are also quite common as 47% use them on their hedging strategies and 37% declared to also use options to mitigate risk. The trader/broker companies tend to use these last two hedging options in more cases as 60% declared to have used time swaps and 50% that they have used options in the past. On the other hand, only 38% of generators declared to have used time swaps and 33% have used options.

Credit risk is also an important issue in this market as 80% of companies say they have restrictions when it comes to choosing a counterpart in a transaction, and 60% say they have a formal credit analysis procedure to comply with. Only 20% don't have a formal credit analysis procedure before approving a transaction.

When specifying which are the specific variables that impact on market risk, we find that spot price (PLD) and the forward price curve have the highest impact and are constantly monitored by the majority of agents. In Figure 6 we summarize the result of this section and presents it in terms of a normalized index (100% to -100%) for each of the risk variables impact and how often do they measure its impact.



Another very relevant variable is the generation scaling factor (GSF) we mentioned before, but the calculation of this risk is not necessarily monitored constantly by every company.

4. International Comparison

Perhaps the influence of foreign companies acting in Brazil or Brazilian Multinationals acting abroad, which represent 40% of the surveyed companies, have turned local risk management practices very similar to practices observed in other international markets. Another important driver of improvements in risk management best practices has been the compliance and control demands on public companies listed in stock exchanges. In this aspect we find that companies with listed stocks have a higher degree of maturity in risk management, with better structure, approved risk policies and report risks directly to high management in the company.

Another notable similarity with other surveys and information from international markets is the order of relevance they attribute to the different risk categories, where regulatory risk and price risk are the main concern most companies have.

We also noted that scenario analysis is common in markets like Brazil and Russia where power contracts have physical backing, versus other markets where financial instruments are more common. In addition, we observed that calculating risks based on mark to market is the most common approach whether the power market is typically physical or financial.

5. Conclusions

This work presents the result of a survey designed to understand the status of risk assessment and control in companies active in the unregulated Brazilian Electricity Market, with a special focus on market risk. An important observation during this work is that risk management is an important and growing aspect of business as many companies indicated that they are investing in people, technology, improving internal controls and establishing official risk policies. We also noted a higher degree of risk aversion at both ends of the industry with pure generators and consumers on both ends, and trader/brokers or generators with trading structures tending to be more risk neutral or willing to take risks.

Differences in the internal structure and complexity of risk analysis were detected in companies that have higher compliance and control requirements, like those that have their stock listed at some exchange. These seem to have adopted more Best Practices from other international markets perhaps because of accounting rules or auditors' recommendations.

Many companies are concerned with implementing risk management best practices and even improving systematization in risk analysis and control, but it is still very common to calculate risk in a very manual way using Excel spreadsheets.

We believe the results of this survey gives us a good representation of the state of the art in risk management in the Brazilian Electricity Market and that it can be used as a benchmark for every company. We can even outline some of the best practices which are not distant from those used in other international markets. The working group pretends to continue this work and get deeper into the definition of Best Practices for risk assessment and control in this market.

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