Structuring Key Credit Risk Parameters for Regulated Electric and Gas Utilities under Alternative Moody's Rating Methodologies: A Case Study for a Natural Gas Distribution Utility

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Abstract

This paper elaborates the relevancy issue of a rating model in the context of credit rating analysis process of a natural gas distribution company. Against this background, we have analysed the Moody's Analytics Risk Calc™ v3.1 Emerging Markets and the Regulated Electric and Gas Rating Methodology of Moody's Investor Services dated from March the 16th, 2017. Methodologically, the article relies on case studies namely the Enron case and a case from regulated natural gas distribution company in Turkey. In terms of findings, Enron case highlights the importance of point-in-time rating models over agency based rating models in terms of default prediction. The EDF model provided a PD value of 0.65%, which corresponds to Baa3 level in Moody's rating agency terms. On the other hand, the REGU Model indicates the Company with "Ba" rating, which is a "Speculative Grade". This result indicates us a severe difference in default probabilities for the same entity. This is consequent and in line with the informational needs of different users and if different models are used respective to their needs. In summary, each rating model is developed by rating agencies for different purposes and we need to choose the appropriate rating model to make accurate analysis.

Keywords: Rating, Credit risk modelling, Moody's.

JEL Classification: G20, G21, G32, G33, C 20, C 51, C88, D81.

Öz - Düzenlenmiş Elektrik ve Gaz Kamu Hizmet Sağlayıcı Şirketlerinin Alternatif Moody's Rating Metodolojileri Altında Ana Kredi Risk Parametrelerinin Yapılandırması: Bir Doğal Gaz Hizmet Sağlayıcısı Vaka Analizi

Bu makale, enerji piyasası denetim otoritesi tarafından regule edilen bir doğalgaz dağıtım firması bazında kredi derecelendirme (rating) analiz süreci içinde kullanılabilecek olan farklı rating modellerinin uygunluk konusunu detaylı bir şekilde analiz etmektedir. Bu çerçeve içinde, Moody's Analytics tarafından geliştirilmiş, Risk Calc™ v3.1 Gelişmekte olan Piyasalar Modeli ile 16 Mart 2017 tarihli Moody's rating kuruluşu tarafından geliştirilmiş "Regüle Edilen Elektrik ve Gaz Şirketleri" için kullanılan Rating Modeli analiz konumuz olmuştur. Çalışmamız metodolojik olarak vaka çalışmaları kullanarak, Enron ve ayrıca gelişmekte olan piyasalardaki regüle edilmiş doğal gaz dağıtım firmalarının Türkiye örneğinde bir şirket dahilinde kredi risk analizine ve modellemesine odaklanmaktadır. Bulgu açısından Enron vakası bizlere zaman noktası modellerinin rating kuruluşları tarafından kullanılan modellere göre Enron'un iflasının çok önceden görebildiğine işaret etmektedir. Analizde kullanılan EDF (Beklenen Temerrüt Frekans Modeli) ise 0.65% oranındaki bir temerrüt olasılığını bizlere göstermektedir. Bu oran ise Moody's rating ajansının Baa3 derecesine denk gelmektedir. Kullanılan diğer "Regu" modeli ise Ba derecesi içindeki spekülatif dereceye işaret etmektedir. Her iki modelinde aynı borçlu firma için farklı derecelendirme ve temerrüt olasılığı hesaplaması dikkat çekicidir. Bu durum ise farklı modellerin farklı kullanıcılar açısından kullanılmaları durumunda farklı modellerin seçilmesi durumunu ortaya koymaktadır. Bu durumda düzgün analizin yapılması için uygun olan modelin seçilmesi önemlidir.

Anahtar Kelimeler: Rating, Kredi risk modellemesi, Kredi riski, Moody's.

JEL Sınıflandırması: G20, G21, G32, G33, C 20, C 51, C88, D81.

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1. Benchmarking of Default Failures inside Natural Gas Distribution – The Case of Enron

Oil & Gas and the related natural gas distribution industries are still within the three contributors to corporate defaults in 2020. Thanks to Covid, the energy environment suffered from a contraction of -62% whereas the contraction in the Oil & Gas utilities sector was labelled with -9% during the heydays of Covid era (Moody's, 2021, pp. 5 – 12). The Oil & Gas and the Natural Gas Distribution Industry is the second largest sector in terms of loan distribution with 6.80% share and the conversion ratio of those sectoral loans into non-performing loans is within the top three notch of 5.60% as of end 2020 report (BDDK, 2020).

The credit wise degeneration of world natural gas distribution business normally starts with the collapse of Enron. Enron's financialisation strategy of SVPs (special vehicle companies) to hide huge losses and debts ends up in default of the natural gas giant. The herculean natural gas power wanted to lead and dominate the world's energy markets changing the business models and the rules of the game. By switching from an ordinary gas pipeline company to the higher orbits of the energy business, it became a "creator of markets". Enron simply converted a "real physical business" into a financial platform even unique and distinctive from the ordinary functioning of banking and financial markets itself. Though methodologically incorrect, they were also clearing every-kind of known banking and financial risks for their clients if their clients wanted to mitigate risks stemming out of the transactions with Enron (Cruver, B. 2003, pp. 29-32). Their business was "commoditization" of everything including risk. If any customer of Enron would face a "risk", there wasn't any risk management instrument that Enron would not "create" to eliminate that risk from the customer. This way, Enron was able to deal with uncertainty on every from of their business. By trading energy, it changed the gas pipelines, which was first built in the late 1800s in New York, into financial highways. By standardizing gas delivery contracts, it became the "market maker" for gas, trading firm that stood ready to make deals in order keep the flow of trades going. Enron also complemented its physical trading with financial trading through derivatives. In 1986, Enron created the first "gas swap" in oil markets exchanging floating prices with fixed ones. In 1990s they invented and traded in forwards and as the decade was over it dived into gas hedging (Fox, L. 2003, pp. 22-42). It outmanoeuvred the old line energy companies in its field but it also carved out the most innovative companies. Enron was trying to become an integrated gas company, with operations in producing gas, delivering and selling gas and trading gas. In addition, Enron

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was trying to maintain a good credit rating (Ibid, p.144). The creditworthiness was needed to keep the funding costs lower, sustain its debt servicing capacity and to finance its huge infrastructure investments in all over the world. After all, if 500 million USD is needed for trading commodities every day, the company was actually in the credit business more than it was in gas or electricity. On December the 2nd, 2001 Enron files for Chapter 11 bankruptcy protection in a New York bankruptcy court. With 63.4 billion worth of assets and its liabilities of USD 18.7 billion arising from derivatives, the filing was the biggest bankruptcy in U.S. history up to that time. The Enron meltdown shook American investors' confidence in the entire financial system (Bryce, R., 2002, p. 7). But why did Enron go from thriving to insolvency over a period of four years? Interestingly, with its USD 138.7 billion revenues, Enron was not able to generate cash flow from operations to pay its hyper aggressive growth and sustain its debt capacity. Enron was simply out of cash and beleaguered with a debt stock of over 100 bln USD (ibid, p. 359). Enron were stuck in the middle of the contradictory strategies. There were two conflicting strategies at Enron: To diversify from natural gas distribution and invest in energy, telecommunications, and other technology businesses. This strategy required that Enron assume more debt to finance these enormous investments. The other strategy was to become an "asset lite company" with more emphasis on trading. This second action required that it should also have the creditworthiness to do business in the financial markets (Fusaro, P.C./Miller, R.M., 2002, p. 68). The designation of "Creditworthiness" for a company was reserved to "nationally recognized statistical rating organizations NRSOs". This government sanctioned oligopoly, which has a quasi-official role as gatekeepers of the financial system, is dominated mainly by Moody's, Standard and Poor's and the Fitch (Fight, A., 2001, pp. 223-225). Today we see the dominance of JCR in the Asia Pasific and in the Middle East within the business model of IRG (International Ratings Group) as well (Langohr, H., 2008, p.406).

1.1. The Downgrade by Rating Agencies

Enron's big problem was the imbalance between its hard core assets and its misrepresentation of its huge debt stock. The misrepresentation of debt was orchestrated through certain investment banks like Merrill Lynch, Citigroup and J.P Morgen Chase by using and manipulating structured finance transaction techniques. By establishing Special Purpose Companies (SPVs) for hiding debt of the whole Enron group of companies, those top banks manipulated and obscured the true financial condition of Enron (Augar, P., 2005, p. 82). This often meant that Enron locked the debt away from the parent company to sustain its "investment grade" rating, where

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Wall Street firms served as counterparties in financial markets were required to have high investment-grade credit ratings. "Without an investment-grade credit rating, Enron was out of business as a market maker in every deal in the market, because no one would trust it to fulfil its obligations as counter-party. Indeed, even with a low investment-grade credit rating, no one should have trusted Enron" (Fusaro, P.C. & Miller, R.M., 2002, p. 63). Whatever the reason for the collapse of Enron, the ultimate truth for the sustainability of Enron was very much dependent on the ratings of NRSOs. A good standing on rating or "investment grade" was badly needed to be a counterparty to sustain its trading business and to fund its investments via issuance of investment-grade bonds or loans. Much if its financing depended on its continuing ability to deliver good grades to the market players in all over the world. It had to sustain the credibility in the market. The opposite of this reality, namely any "downgrade" would mean "bankruptcy" in juristically terms and this would be translated into the language of risk and rating as a process of "default" technically.

On October the 29th, 2001, Moody's Investor Services tested the "credibility" of Enron by downgrading Enron's long-term debt. The impact of a lower credit rating on Enron was increased financing cost and more important than that was the lender's call on their outstanding exposures to close out the debts (Crouver, B., 2003, p.144). The rating was "mission-critical" for Enron. Any migration from an investment grade to a "state of junk" which is designated by a rating below Baa3 or BBB- would mean a "default" on billions of dollars in debt. The Enron drama for the month of November involved the quest for a white knight to save it before the ratings agencies lowered the boom and cut its credit rating to junk. This white knight was the Robert Rubin, the CEO of Citibank, who tried to convince the U.S. Treasury to "call the rating agencies" and defer the downgrading of the victim company. Enron's vulnerability to downgrade became an important public policy concern for the Government, the energy markets and for the big global banks (Augar, P., 2003, pp. 182-183). On the Government's side the president of Federal Reserve, Alan Greenspan commented on the fall of Enron as "There has been so much gaming of the system until it is broke. Capitalism is not working and there is a whole in the present system" (Mallaby, S. 2016, pp. 599-600).

1.2. The Clash of Rating Models

Towards the end, Enron's bonds had dropped sufficiently in price that their yields were comparable to some of the worst junk bonds. Credit ratings agencies that relied on different risk rating systems and models, such as Moody's KMV Corpora-

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tion of San Francisco[1], had already effectively downgraded Enron to junk. Moody's, Standard & Poor's, and Fitch all relied on human analysts to rate credits, and these analysts' bosses were getting calls from Enron begging them not to downgrade it (Fussaro/Miller, p. 120). Fitch, Moody's, and S&P came under intense criticism after the collapse of Enron in December 2001. All big three came under intense criticism after the collapse of Enron in December 2001. Their methodologies were considered opaque, inaccurate, and outdated (Norbert G., 2012, p. 68). The deficiency in bankruptcy prediction brought Moody's to the revising of their models towards more market implied models like EDF (Expected Default Frequency). The gap between the two different rating universes is illustrated by Moody's in the Exhibit 1 below:

Exhibit1: Default Diagrams of Enron by Agency Rating and the EDF
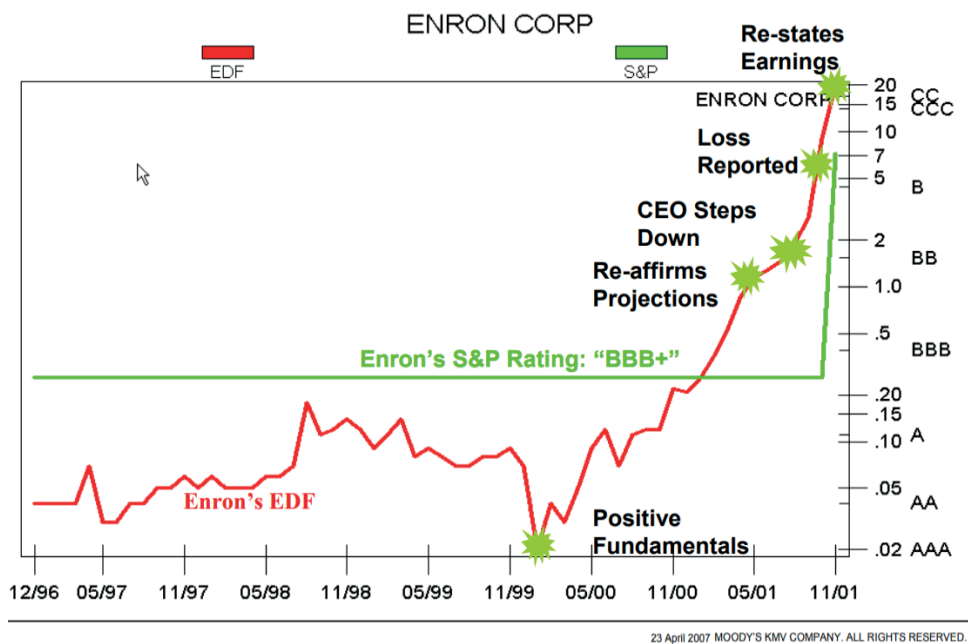
Source: Moody's KMV Credit Analysis Solution presentation for the Energy Industry

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1   Possibly because of the flak it caught for the Enron episode, Moody's would see the virtue of objective rating methods and acquired all of KMV early in 2002. KMV is now known as Moody's Analytics

The Exhibit 1 shows explicitly the evolution of the EDF, which measures the credit risk of Enron as in form of default probabilities. As depicted by the graphics above, the time lag between the EDF curve and the S&P rating stands at almost a year. EDF model leads the agency model almost a year. EDF as being a pioneer of "market implied rating models" predicts the default of Enron notch-by-notch through a migration process during 2001. On the other hand, credit ratings are just one of many opinions about an issuer's creditworthiness and this opinion stays the same almost until the final bankruptcy of the Energy giant as of end 2001. Since the fall of Enron the disagreements between Moody's ratings and other valuation and market implied risk metrics even by Moody's Analytics have been around for a long time. This gap in two different rating systems classification and diversions in default forecasting brings us to the understanding and describing the Market Implied Ratings platform, datasets, and applications in comparison to the applications of agency based rating models used by Rating agencies.

1.3. The Purpose of the Research

Referring back to the initial explanations at the extended abstract part, we are of the opinion that there are still severe disagreements about the measurement of creditworthiness drawn from the different sources of systems such as Fundamental Agency Ratings, Expert-Based Approaches and the Statistical-Based Models. The rating agencies approach is very interesting because judgmental-based analysis is integrated with market based model approaches to diminish the asymmetric risk difference about the true debt service capacity of the borrower. (De Laurentis et all, 2010, p. 22). Since the collapse of Enron, the traditional agency rating methodologies are hammered with more market-based models to allow a much better understanding of credit risk (Ranson, J.B. 2005, p. 3-19). Therefore, to increase the efficiency of the rating process, we have decided to allocate two different models of the same institution to see the end result of the analysis. The purpose of this paper is threefold:

1. To reveal the constituencies of both models

2. Make sure how to evaluate the alternative rating models in analysing credit risks for regulated gas distribution companies on basis of Moody's Investor Services agency rating model and the market implied model of Moody's Analytics.

3. Implementing the RiskCalc 3.1 EM Methodology by extending the model

with the rating agency based model in an analysis of a Natural Gas Distribution Company in Turkey.

We have analysed and used the following two models:

a)   Regulated Electric and Gas Rating Methodology of Moody's Investor Services dated from March the 16th, 2017. This rating methodology explains Moody's rating approach to assessing credit risk for regulated electric and gas networks globally. It provides general guidance that helps companies, investors, and other interested market participants understand how qualitative and quantitative risk characteristics are likely to affect rating outcomes for companies in the regulated electric and gas networks industry. It does not include an exhaustive treatment of all factors that are reflected in Moody's ratings but should enable the reader to understand the qualitative considerations and financial information and ratios that are usually most important for ratings in this sector

b)   Moody's Analytics RiskCalc™ v3.1 Emerging Markets (EM) intended for private firm probability of default (PD) assessment in all the emerging markets not covered by the existing RiskCalc models dated from 25th of October, 2010.

The aim of this extensive and detailed analysis is to provide an example how information on financial statements will be converted into default data to anticipate the deterioration in financial conditions of a natural gas distribution company by extending the financial statement information to the level of market based evaluation level. In this manner, we will reveal to the analysts that classical rating based analysis is never the end of a sound credit risk analysis, where deductions about the probability of default of a company may give rise to the funding costs and hence to the efficiency in financial management of a company. Within this methodological context in the end, good management of credit risks of a natural gas distribution must be perceived as good as for the public and government as well. Natural gas which is a very strategic commodity in emerging markets should be transferred in confidence and managed by a business who cannot tolerate any business failure and unhedged financial risk at a level of bankruptcy. RiskCalc v3.1 EM claims to confront this challenge than its predecessor or competitive models in the market.

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2. The Principles of Rating Models

2.1. Introduction to Statistical Methods: Logistic Regression

There are two types of rating models which differ structurally:

1. Scorecards Model: They are "Weighted Sum Scorecard Models.

2. Fundamental Analysis Models: They provide a more layered analysis for identifying the Rating of an obligor.

In a Scorecard based model, a scoring model specifies how to combine the different pieces of information (factors) in order to get an accurate assessment of default probability, thus serving to automate and standardize the evaluation of default risk within a financial institution. A score summarizes the information contained in factors that affect default probability (Loffler, G. & Posch, P. 2007, pp. 2-4). Standard scoring models take the most straightforward approach by linearly combining those factors. Let "x" denote the factors (their number is K) and "b" the weights (or coefficients) attached to them; we can represent the score that we get in scoring instance "i" as:

$$Score_i = b_1 xi_1 + b_2 xi_2 + ... + b_{K} . x_{i.} \qquad (1.1)$$

Collecting the b's and the x's in column vectors b and x we can rewrite (1.1) to:

$$Score_i = b_1 xi_1 + b_2 xi_2 + ... + b_K . xi_K = b'xi \qquad (1.2)$$

A common characteristic of a generalized scoring model is characterized by the presence of three elements:

a.   A random component $(Y_. Ber (\Pi))$ - a Bernoulli dependent variable, which identifies a target variable as an expression of a probability function.

b.   A systematic component that specifies explanatory variables in form of a linear combinations with their coefficients.

c.   A link-function of the mean of the target variable that the model equates to the systematic part of the scoring function (De Laurentis, G. 2010, p. 54).

The scoring model should predict a high default probability for those observations that defaulted and a low default probability for those that did not. In order to choose the appropriate weights b, we first need to link scores to default probabilities. This can be done by representing default probabilities as a function F of scores:

Prob (Default$_i$) = F(Score$_i$)   (1.3)

Like default probabilities, the function F should be constrained to the interval from 0 to 1; it should also yield a default probability for each possible score. The requirements can be fulfilled by a cumulative probability distribution function. A distribution often considered for this purpose is the logistic distribution. The logistic distribution function Λ (z) is defined

As Λ (z) = exp (z) / (1+exp (z))

Applied to (1.3) we get:

Prob (Default$_i$) Π_i = Λ (Score$_i$) = exp (b'x$_i$) / 1+ exp (b'x$_i$)

= 1 / 1+ exp (-b'x$_i$)   (1.4)

To summarize how Scorecard type models use a weighted sum structure is defined as below:

- Each factor receives a score

- All factors are summed to make a section score

- All sections are summed to make a final score

- The final score can be mapped to a grade and or PD (static)

- Grades can be overridden if a user has permission.

Models that link information to probabilities using the logistic distribution function are called "Logit models". Logit models express the logarithm of default probability as a function of predictor variables i.e financial data or ratios. The input ratios (x$_i$) that are used by RiskCalc methodology are as follows (Smithson, Ch.W., 2003, pp. 63-66):

- Assets/CPI (consumer price index) - growth variable
- Inventories / COGS (cost of goods sold) - leverage ratio
- Liabilities / Assets - size ratio
- Net Income / Growth - growth ratio
- Net Income / Assets - growth ratio

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- Quick Ratio - liquidity ratio
- Retained Earnings / Assets - profitability ratio
- Sales Growth - growth variable
- DSCR (debt service cover ratio) - liquidity variable
- Cash / Assets - liquidity variable

The usage of the ratios in its purest form is avoided by Moody's as the input financial ratios ar highly "non-normally distributed. By using a univariate nonparametric analysis[2], the company uses ranks instead of pure numbers or ratios. This process, which uses an extra transformation function T for each ratio x_i, ends up in calculation of cumulative default probabilities is called Expected Default Frequency (EDF) process. The EDF is expressed as Probability (Default) = N (β' x T (x)), whereas β' is the row vector of 10 weights, T(x) is the column vector of the above mentioned articles and N(x) is the cumulative standard normal distribution function (ibid, p.66).

2.2. Regulated Electric and Gas Rating Methodology of Moody's

The recent rating methodology dated from March 16, 2017 explains Moody's approach to assessing credit risk for regulated electric and gas networks globally. "It provides a general guidance that helps companies, investors, and other interested market participants the necessary understanding for qualitative and quantitative risk characteristics, which are likely to affect rating outcomes for companies in the regulated electric and gas networks industry" (Moody's, March 2017, pp. 1-39). Regulated Electric and Gas Utilities are companies whose predominant business is the sale of electricity and/or gas or related services under a rate-regulated framework, in most cases to retail customers.

2.2.1. The Nature of the Business

The electric and gas utility industry consists of companies that are engaged in the generation, transmission, and distribution of electricity and/or natural gas. The distribution of natural gas entails the transport of gas from delivery points along major pipelines to customers in their service territory through distribution pipes. The natural gas markets are heavily regulated and overseen by independent, quasi-judicial governmental regulatory bodies. The Regulation may have a supportive or unsupportive environment on rating depending on the incentives and pricing mechanisms provided on the players inside the industry. As long as the distribution tariff rate changes are passed automatically to the markets, those cost pass mecha-

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2   By non-parametric, we mean that the T(xi) is a continuous function of x not requiring a specification of a specific closed (or parametric) functional form.

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nisms may have positive impact on the credit profiles of the gas utilities. However, any tariff adjustments which do not allow automatic pass-through mechanisms to the utilities provide weak credit metrics to those entities. Regulated Electric and Gas Utilities are companies whose predominant business is the sale of electricity and/or gas or related services under a rate-regulated framework, in most cases to retail customers but not limited to the corporate customers as well. Also included under this methodology are rate-regulated utilities that own generating assets as any material part of their business. In this manner utilities whose charges or bills to customers include a meaningful component related to the electric or gas commodity. In general, these entities are municipalities, and companies providing an independent system operator function to an electric grid. Companies rated under this methodology are primarily rate regulated monopolies or, in certain circumstances, companies that may not be outright monopolies but where government regulation effectively sets prices and limits competition (ibid, p.3).

2.2.2. The Rating Methodology for Regulated Electric and Gas Utilities (REGU - Modell)

The first rating methodology that was developed for rating of regulated electric and gas utilities was published in 2005 by Moody's. With several refinements made even by the year 2018, core principles and factors that are important for this sector stays mostly the same. The REGU-Modell aims to wipe-out the clouds on the contours of credit risk within the nomenclature of an alpha-numeric rating notches. The rating universe consists of investor-owned and commercially oriented government owned local distribution companies that are engaged in the production, transmission, distribution and/or sale of electricity and/or natural gas. Moody's approach for rating fundamental analysis focuses on four key rating factors that are central to the assignment of ratings for companies in the sector. The four section factors are as follows The Moody's REGU Modell is based on four core rating sections for the subsequent rating factors. The main constituents of the core sections of the Grid are (Moody's 2009, p. 1. See also Moody's 2017, p.4):

1. Section 1: Regulatory Framework
2. Section 2: Ability to Recover Costs and Earn Returns
3. Section 3: Diversification and Market Position
4. Section 4: Financial Strength and Liquidity Metrics

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2.2.2.1. Section 1: Regulatory Framework (RegFrame)

Regulated utilities are by nature monopolistic entities with heavy asset burden on their shoulders. In publicly owned entities this monopolistic entity is faced with the regulatory burdens and political decision-makers requests that might be not always "market confirm". Large and significant changes in the political, economic and regulatory environment may cause business interruptions for the utilities. Therefore, the predictability, consistency and transparency in regulation of the natural gas distribution companies has always been a major risk factor. The existence of an independent regulator is always found to be credit positive for utilities. The reverse is also thinkable and the regulatory instances would compress the returns of the entities. Any private entity, who would try to abuse the market dynamics, would face the interventions and judiciary actions of the regulatory instances to sustain the consumer benefits in the market. RegFrame effectively limits the market power of gas sellers (Jaffe, A.M./Soligo, R., 2006, p. 468). In this manner RegFrame sets the tone of "uncertainty" versus "predictability" for a stable and reliable market conditions for the utilities. In this context, a less developed regulatory framework reminds us the existence of a high degree of political interventions into the dynamics of the market. Regulatory Environment defines a utility's general position with respect to business and financial risks through the establishment of prices or rates.

As being "the major risk factor", section one is weighted with 25% risk weight. The section one is divided by two other sub-risk factors legislative and judicial underpinnings of the regulatory framework and the consistency and predictability of the regulation, each sub-factor enjoying a weighting of 12.5%. The sub-rating factors are mapped to the Moody's rating grid as follows:

Exhibit 2: Regulatory Framework for Natural Gas Distribution

FACTOR 1					
Aaa	**Aa**	**A**	**Baa**	**Ba**	**B**
Regulatory framework is fully developed, has a long-track record of being predictable and stable and is highly supportive of utilities. Utility regulatory body is a highly rated souvereign or strong independent, regulator with unquestioned authority overy utility regulation that is national in scope.	Regulatory framework is fully developed, has been mostly predictable and stable in recent years, and is mostly supportive of utilities. Utility regulatory body is a souvereign, souvereign agency, provincial, or independent regulator with authority over most utility regulation that is national in scope.	Regulatory framework is fully developed, has above averag predictability and reliability, although is sometimes less supportive of utilities. Utility regulatory body may be a state commission or national, state provincial or independent regulator	Regulatory framework is a) well-developed, with evidence of some unpredictability in the way framework has been applied, er framework is new and untested, but based on well-developed and established precedents, or b) jurisdiction has history of independent and transparent regulation in other sectors. Regulatory environment may sometimes be challinging and politically charged.	Regulatory framework is developed, but there is a high degree of inconsistency or unpredictability in the way the framework has been applied. Regulatory environment is consistently challenging and poltically charged. There has been a history of difficult or less supportive regulatory decisions, or regulatory authority has been or may be challenged or eroded by political or legislative action	Regulatory framework is less developed, is unclear, is undergoing substantial change or has a history of being unpredictable or adverse to utilities. Utility regulatory body lacks a consistent track record or appears unsupportive, uncertain, or highly unpredictable. May be highr risk of nationalisation or other significant government intervention in utility operations or markets.

Source: Moody's Rating Methodology, Regulated Electric and Gas Utilities (10 August 2009:7)

2.2.2.2. Section 2: Ability to Recover Costs

We generally consider a company to be predominantly a regulated electric and gas utility when a majority of its cash flows, prospectively and on a sustained basis, are derived from regulated electric and gas utility businesses. Since cash flows can be determined by the regulatory authority, the ability to recover prudently incurred costs in a timely manner is perhaps the single most important credit consideration for regulated utilities as the lack of timely recovery of such costs has caused financial stress for utilities on several occasions (Moody's 2009, p. 7). Hence the ability of most utilities to pass their energy costs to end users may be severely blocked by the regulators. Especially during the times of extreme forex volatility, the reluctance to provide rate relief and/or large scale price adjustments on customers may distort the liquidity and the profitability of the utility severely. In times and in regions where the gas distribution network should be extended, the infrastructure needs expansion investments and this would create a growing and ongoing need for rate increase or new capacity recovery rates to provide ROI for those expansion capital expenditures. If the regulatory instances may defend a "statutory disallowance position" with re-

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spect to these new challenges, this situation may result in a downgrade of the company. The ability to recover prudently incurred costs in a timely manner is the single most important credit consideration and would enjoy a score of 25% weighting. The rating sub-factors are mapped to Moody's rating grid as follows:

Exhibit 3: Cost Recovery and Return Earning Capability

FACTOR 2 — ABILITY TO RECOVER COSTS AND EARN RETURNS (25%)					
Aaa	**Aa**	**A**	**Baa**	**Ba**	**B**
Rate/Tariff formula allows unquestioned full and timely cost recovery, with statutory provisions in place to preclude any possibility of challenges to rate increases or cost recovery mechanisms.	Rate/Tariff formula generally allows full and timely cost recovery. Fair return on all invesments. Animal challenges by regulators to companies cost assumptions consistent track record of meeting efficiency tests.	Rate/tariff reviews and cost recovery outcomes are fairly predictable (with automatic fuel and purchased power recovery provisions in place where applicable) , with a generally fair return on investments. Limited instances of regulatory challenges; although efficiency tests may be more challenging; limited delays to rate or tariff increases or cost recovery.	Rate/tariff reviews and cost recovery outcomes are usually predictable, although application of tariff formula may be relatively unclear or untested. Potentially greater tendency for regulatory intervention, or greater tendency for regulatory or greater disallowence (e.g. challenging efficiency assumptions) or delaying of some costs (even where automatic fuel and purchased power recovery provisions are applicable).	Rate/tariff reviews and cost recovery outcomes are inconsistent, with some history of unfavorable regulatory decisions or unwillingness by regulators to make timely rate changes to adress market volatility or hihger fuel or purchased power costs. AND/OR Tariff formula may not take into account all costs components; investments are not clearly or fairly renumerated.	Difficult or highly uncertain rate and cost recovery outcomes. Regulators may engage in second–guessing of spending decisions or deny rate increases or cost recovery needed by utilites to fund ongoing operations, or high likelihood of politically motivated interference in the rate/tariff review process. AND/OR tariff formula may not cover return on investments, only cash operating costs may be renumarated.

Source: Moody's Rating Methodology, Regulated Electric and Gas Utilities (10 August 2009, p. 12)

2.2.2.3. Section 3: Diversification

We can identify three separate groups of companies with differing, and sometimes alternative, features with respect to the gas chain, technological development, international presence, degree of diversification and public/private ownership. Diversification means the division of business lines among several markets, institutions, products and regions in general. Diversity in natural gas distribution and in supply is a "must". Diversification helps to mitigate the business risk which would stem from the regulatory instances or from the volatilities in the market (commodity price increases) or from any economic downturn. The flexibility of LNG flows is a major advantage but, at the same time, presents a problem for importing countries. The benefits are supply diversification and a flexible and liquid spot market. In the event of a liquefaction capacity shortage, however, importing countries may face serious difficulties of supply and hence price shocks which may potential push the

costs of distribution companies effectively (Gilardoni, A. 2008, pp. 93- 139).

Any concentration on the level of supply or demand would immediately cause a rapid deterioration in the creditworthiness of the utilities. For local gas distribution companies without significant generation, the key criterion we use is the diversity of their operations among various markets, geographic regions or regulatory regimes. A division between corporate and retail clients and the corporates overweight inside the client portfolio would receive a higher score in terms of rating. For these utilities, the first set of criteria, labeled market diversification, account for the full 10% weighting for this factor. Generally, only the largest vertically integrated utilities with substantial operations that are multinational or national in scope, or whose operations encompass a substantial region within a single country, will receive scores in the highest Aaa or Aa categories for this factor (ibid, p.9). The Diversification criteria are sub-divided by Market Position and by the Generation and Fuel Diversity for the Grid. The sub-factors above are mapped to Moody's rating grid as follows:

Exhibit 4: Rating Factor 3-Business and Market Diversification

Factor 3: Diversification (10%)							Sub-Factor Weighting
	Aaa	Aa	A	Baa	Ba	B	
Market Position	A high degree of multinational/regional diversification in terms of market and/or regulatory regime.	Material operations in more than three nations or geographis regions providing diversification of market and/or regulatory regime.	Material operations in two or three states, nations, or geographic regions with low and exhibits some diversification of market and/or regulatory regime.	Operates in a single state, nation, or economic region with low volatility with some concentration of market and/ or regulatory regime	Opeates in a limited market area with material concentration in market and/or regulatory regime.	Operates in a single market which may be an emerging market environment with high concentration risk.	50%
	For LDC's extremely low reliance on industrial customers and/or exceptionally large residential and commercial customer base and well above average growth.	For LDC's, very low reliance on industrial customers and/or very large residential and commercial customer base with very high growth.	For LDC's, low reliance on industrial customers and/or high residential and commercial customer base with high growth.	For LDC's moderate reliance on industrial customers in defensive sectors, moderate residential and customer base.	For LDC's, high reliance on industrial customers in somewhat cyclical sectors, small residential and commercial customer base.	For LDC's, very high reliance on industrial customers in cyclical sectors, very small residential and commercial customer base.	50%
Generation and Fuel Diversity	A high degree of diversification in terms of generation and/or fuel source, well insulated from commodity price changes, no concentration or 0-20% of generation from carbon fuels.	Some diversification in terms of generation and/or fuel source, affected only minimally by commodity price changes, little generation concentration, or 20-40% of generation from carbon fuels.	May have some concentration in one particular type of generation or fuel source, although mostly diversified, modest exposure to commodity price changes, or 40-55% of generation from carbon fuels.	Some reliance on a singley type of generation or fuel source, limited diversification moderate exposure to commodity prices, or 55-70% of generation from carbon fuels.	Operates with little diversification in a single type of generation or highly reliant on a single fuel source, little diversification may be exposed to commodity price shocks, or 70-85% of generation from carbon fuels.	High concentration in a single type of generation or highly reliant on a single fuel source, little diversification may be exposed to commodity price shocks, or 85-100% of generation from carbon fuels.	50%

Source: Moody's Rating Methodology (10 August 2009, p.10).

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2.2.2.4. Section 4: Financial Strength, Investment and Liquidity

The leading players in the market are highly capital intensive, financially strong with over 300 billon turnover per year (Gillardoni, A. p. 7), with a global presence which presumes a strong financial wellbeing. The business of natural gas distribution demand ongoing need to invest in generation, transmission and distribution. In this sense those huge sums of capital investments require substantial amount of debt funding and investment in infrastructure is essential to maintain security of supply. Within this wisdom, when it comes to the investments in gas market, the main objective is to make gas networks and relevant facilities capable of delivering more gas in any direction with the least cost (Bayraktar, A. 2018, p.23). A strong economy coupled with population growth creates the need for more natural gas and pipeline infrastructure. In addition, government policies and incentives for new investments and existing gas delivery infrastructure could enable or hinder gas consumption. The population in the end-market is one proxy of Demand Growth and the need for further capacity investments, which is also essential for the financial soundness of the gas utilities (Moody's 2018, p. 5). For this scoring grid, Moody's has identified four key ratios that they consider the most consistently useful in the fundamental analysis of regulated electric and gas utilities.

a) CFO Pre-Working Capital Plus Interest/Interest or Cash Flow Interest Coverage.

The cash flow interest coverage ratio reveals the ability to cover the funding costs of a utility. The numerator in the ratio calculation is the sum of CFO Pre-WC and interest expense, and the denominator is interest expense. This important metric is an indicator for the cash generating ability of a utility compared to its total debt. The numerator in the ratio calculation is CFO Pre-WC, and the denominator is total debt.

b) CFO Pre-Working Capital Minus Dividends / Debt.

This ratio is an indicator for financial leverage as well as an indicator of the strength of a utility's cash flow after dividend payments are made.

c) Debt/Capitalization ratio indicates the leverage level of a utility. The numerator is total debt and the denominator is total capitalization, where the capitalization includes total debt, preferred stock, other hybrid securities, and common equity as major capital items.

Moody's rating methodology identifies further sub-factors which are influential on the business and financial risk contours of a utility. The first model benchmarked

and integrated following key factors to its broad sections. The relevant sub-factors and key financial ratios are mapped to Aaa or Aa ratings in this methodology as shown in Appendix A.

3. Moody's Analytics Risk Calc™ v3.1 Emerging Markets M

3.1. The Reason for an Extended Model

The Rating Methodology for Regulated Electric and Gas Utilities (REGU - Modell) is a notable and standard model reserved for the specifics of natural gas distribution utilities used by CRDs. Under this context, the rating results from pure fundamentals of natural gas distribution business. Contrary to the usual rating implementation process where the rating is normally based on a single model such as REGU, this single model in the current rating schemes is not without inadequacies. "The business natural gas distribution" is not the only major rating factor if the business takes place in adversary business and financial environment. Other criteria that have been used as important parameters in evaluating the rating stems from the "normality's of emerging markets" if the subject company to be rated is in a different and difficult rating universe. This reality confronts us to use an extended model consisting of other important parameters in building credit risk evaluation systems for different market contexts. In addition, the extended model should allow users to customize the calibration to reflect heterogeneity in PD level across markets. Therefore, this chapter aims to integrate and diversify the scoring based model in a diverse context such as "emerging market" and explores the different aspects of a Regulated Electric and Gas Utility Rating Scheme. The Moody's "RiskCalc v3.1" model powers the next-generation of default prediction technology for middle market, private firms. The model distances itself from the standard scoring models of rating agencies with the extension of market based information. With RiskCalc v3.1, Moody's Analytics seeks an answer to the question for "How can we support our decision-making process for extending loans, managing portfolios pricing debt securities when there is little available market insight into a firm's prospects, as is the case for middle market credits?". The RiskCalc v3, developed in 2004 is further extended with in 2010 with emerging markets version.

3.2. RiskCalc v3.1 Emerging Market Modeling Methodology

3.2.1. Foundations and Financial Ratios Used

The RiskCalc v3.1 model integrates the market-based structural models to the financial statement-based approach refined in section 2 of our research. By blending

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classical factor based fundamental analysis (idiosyncratic risk factors) with the systemic risk based market information, the predictive power of the model is increased severely and yields better results in determining credit risk of a mid-market company despite the lack of market equity prices for private firms (Moody's 2004, p.7). When this information is not available, asset value and asset volatility are estimated using financial statement data and industry versus country comparable by using private firm model of Moody's (Glantz, M. 2002, p. 524). In case equity volatility and market caps are not available, the public company default risk model architecture and philosophy can be leveraged to calculate default risk of unlisted companies. The necessary input is generated by neural networks trained to estimate the volatility characteristics and hypothetical market capitalization of a given firm. The answer to this challenging task lies in developing the neural network approach because of its ability to model nonlinearities (Gaeta, G. 2003, p. 393). A very important issue in developing a default framework is the consideration of multiple sectors in different countries. With inputs a derived from readily company financials, markets and data generated from the hypothetical neural networks, a structured model development becomes the ultimate goal to adapt the model across different countries and industries.

RiskCalc v3.1 Emerging Markets has nine industries: Trade, Business Products, Agriculture, Construction, Services, Consumer Products, Mining. The sample includes data from the following 24 countries regions (Moody's 2010, p. 8).

The RiskCalc's "structural model" translates the default signals of market equity prices to the firm-specific financial statement model of credit risk[3]. In contrast to public firms, market prices for claims on and the assets of private firms are generally not available, which complicates the usage of "structural models" for the companies that are not traded in the stock market. Moody's applies structural models of default by incorporating ratings and financial statement variables together with the theoretical risk neutral "Expected Default Frequency™ (EDF™)"methodology (Saunders, A./ Allen, L. 2002, p. 64). The financial risk drivers used in the model fall into the following groups (Ranson, B. 2005, pp 3-24:3-27). The RiscCalc v3.1 Emerging Markets Model uses the financial statement variables in parenthesis (Moody's Analytics 2010, p. 15):

Profitability: The profitability group uses net income, Ebitda and operating profit over the total assets and sales. Increasing profitability e.g. ROA is an indication for

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3   A good reference for a comparative analysis of current credit risk models is found in: Crouhy, M. / Galai, D. / Mark, .R: A Comparative Analysis of Current Credit Risk Models. In: Journal of Banking &Finance 24 (2000), pp. 59-117.

a decreasing default probability (pd). The profitability is weighted higher 19.14% in the model.

Leverage (Total Liabilities/Total Assets): This ratio indicates the total volume of assets that a company can create by using liabilities of foreign sources. The relation is based on the premise that higher volume of debt constrains the debt capacity of an entity and hence increases the pd of a company. The Leverage ratio is weighted as 18.61% for one year EDF.

Growth (Sales Growth): Growth of a company is always measured by assets, turnover and equity. Fast growing companies higher asset volatilities and the higher growth rates do not always indicate lower pd levels. The relationship is usually a u-shaped curve where the growing sales decreases the pd first and after crossing a threshold level, the pd levels start to rise as well. Growth of a company is always a delicate issue with respect to the credit risk of a company. The Growth is weighted as 9.45%.

Size (Total Sales- inflation adjusted): The same argument applies to the Size (sales volume and assets) as well. Large firms may face lower pds due to their access to the availability of sources. Companies which are below a critical size level may have a limited capacity to the resources which might act negatively on the pd level. The Size is weighted as 3.71%.

Liquidity (Cash and Marketable Securities/Total Assets): Basically comprised from cash and cash equivalents, liquidity is the means for debt payment capacity with which the company fulfills its short term premises. The shortage in liquidity r a higher level pd of a company. The Liquidity ratio is weighted as 18.71% for one year EDF.

Activity (Inventory/Sales): Activity ratios are a measure for operational efficiency and driven by the working capital management items in the balance sheet of a company such as stock levels to turnover or account receivables over sales and trade payables over cost of goods sold ratio. The higher those ratios the lower the pd of a company. Activity ratio is weighted as high as 11.71% for one l EDF calculation.

Coverage (Ebitda to Interest Expense): The ratio of cash flow to interest payments or some other measure of liabilities. $\rightarrow$ High debt coverage reduces the probability of default. The Coverage ratio is also weighted as high as 18.61% for one l EDF calculation.

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The pd prediction power of the above mentioned ratios, which are lagged, extended by incorporation of systemic risk to the model by introducing the market information. RiskCalc takes market information at the industry level, where the company specific ratios are used in combination with industry-specific data of the public companies (Ranson, B. p. 3-27).

3.2.2. Assessing Default Risk through EDF

Moody's provides a remarkable solution by relying on the concept of "the distance-to-default measure". This revolutionary credit risk model indicates that the default process of a company is depicted by the number of standard deviations (SDs) as an indicative distance between the expected asset value of the firm at Horizon (H), and the default point, normalized by the standard deviation (σ). Formally, the distance-to-default is defined as follows (Ong, M.K. 1999, pp.84-88):

$$DD = (E\,(V_h) - DPT_H) / \sigma \qquad\qquad (1)$$

whereas the DPT (Default Point) is roughly approximated as,

$$DPT_H = STD + 0.5\ LTD \qquad and, \qquad\qquad (2)$$

$$Q = Pr\,(VT \le F) \qquad\qquad (3)$$

determines the probability of Default, which is the likelihood that the Asset Value A_V at time H falls to the level of DPT_H. Under the "risk-neutral" probability assumption, the pd is given by the equation as follows:

$$Q = Pr\,(\ln V_0 + (r - 0.5\sigma^2)\,H + \sigma\,\sqrt{H}\,Z_H \le \ln DPT_H) \qquad\qquad (4)$$

$$Q = Pr \quad (Z_H \le \underline{-\ln\,(V_0\,/\,DPT_H) + (r - 0.5\sigma2)\,H} = d2\ ) \qquad\qquad (5)$$

$$\sigma\sqrt{H}$$

$Q = N\,(-d2)$ N(.) is the standard normal cumulative distribution and similarly, EDF corresponds to the Distance-to-Default via standard normal distribution parameter as

$$EDF \equiv N\,(-d2) \qquad\qquad (6)$$

In other words, the Distance-to-Default DD is the range between the mean of the Asset Value distribution written as

$$E\,(VH) = V_0\,e^{\,(\mu\,T)} \qquad\qquad (7)$$

and the critical threshold, DPT for defaulting (Ong, M. p. 84).

EDF is the probability that a firm will default within a given time horizon on its SD determined path. In this manner, one can develop a model to imply a default rate based on various signals available: equities, bonds, credit default swaps, fundamental financial information, or even agency ratings[4]. EDF is the probability that a firm will default within a given time horizon by failing to make an interest or principal payment. EDF measures are provided for time horizons of 1 to 10 years and it ranges from .02% to 20%, i.e., 2 to 2000 basis points.

EDF is driven by the following parameters:

1. Market Value of Assets (or Business Value)
    Market assessment of the future cash flows of the business Value of the firm as a "going concern"

2. Default Point (or Liabilities Due)
    The liabilities due in the event of distress

3. Asset Volatility (or Business Risk)
    The variability of the market value of assets

4. Distance the Default.
    The distance to default is determined by the long term and short debt level of a company.

Exhibit 4: EDF Drivers, Distance to Default and Default Point
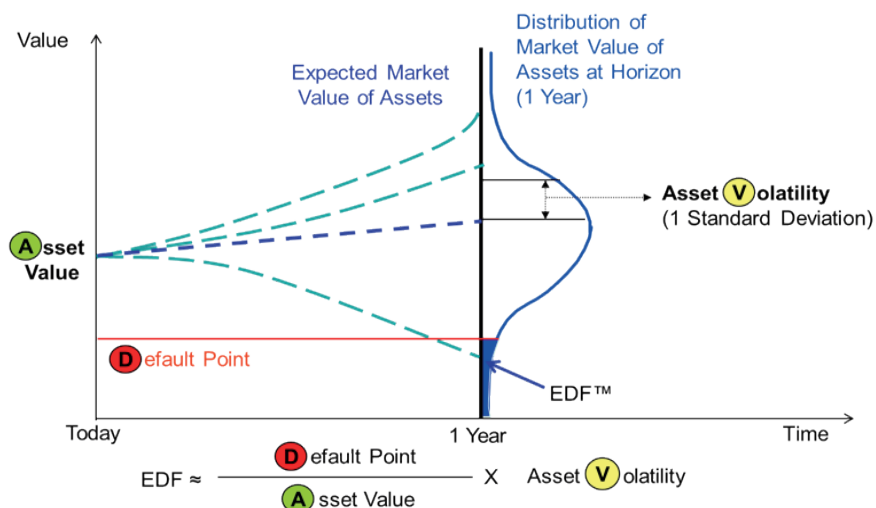
Source: Moody's Analytics, 2003, p.9

4   For more about EDF Moody's KMV: EDF implied Ratings, Modelling Methodology, June 2007.

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3.2.3. Model Components and Basic Methodology

RiskCalc v3.1 model development involves the following steps.

1. Choose a limited number of financial statement variables for the model from a list of possible variables.

2. Transform the variables into interim probabilities of default using non-parametric techniques

3. Estimate the weightings of the financial statement variables using a probit model, combined with industry variables.

4. Create a (non-parametric) final transform that converts the probit model score into an actual EDF credit measure. Moody's Analytics bases the models on the following functional form:

$$FSO\ EDF = F\left(\Phi\left(\sum_{i=1}^{N}\beta_i T_i(x_i) + \sum_{j=1}^{K}\gamma_j I_j\right)\right)$$

FSO means Financial Statements Only mode of the EDF credit risk. $X_1,...,X_N$ are the financial ratios and default estimators. To recognize different industry-wide trends in the model, $I_1,...,I_K$ indicator variables are used for each of the industry classifications[5]; β and γ are estimated coefficients for model calibration purposes; Φ is the cumulative normal distribution. The Tis capture non-linear impacts of financial ratios on the default likelihood. F and $T_1,...,T_N$ are non-parametric transforms and T(xi) is a continuous function of x not requiring a specification of a closed (i.e., parametric) functional form. Tx transformations are done by using a variety of local regression and density estimation techniques. We refer to F as the final transform. The final transform captures the non-Gaussian relationship between the default-probability and standardized and transformed input variables inside the Φ. The final transform also internalizes the empirical relationship between the probit model score and the actual default probabilities. The final transform is described as calibrating the model score to an actual EDF credit measure. This functional form is closely related to a class of models known as generalized additive model (Moody's Analytics, p. 14). Emerging Markets model is calibrate to a Central Default Tendency of 4% and may

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5   Given the same set of financial ratios, the Agriculture industry coefficient typically moves the EDF level up by about one notch (e.g., from Ba3 to B1), and the Consumer Products industry coefficient typically moves the EDF level down by about one rating notch (e.g., from Baa1 to A3).

be increased by a factor of 1.5 depending on the country. This is very much close to the expected loss of a loan facility to be facilitated in an emerging country.

4. Implementing Moody's RiskCalc v3.1 Emerging Market Modeling and The Regulated Electric and Gas Utility Rating Case in Turkey

Our case study involves the credit risk analysis and assignment of a rating to Regulated Electric and Gas Utility (REGU-TR) in Turkey, whose business is predominantly the sale of natural gas or related services under a rate-regulated framework to retail and corporate customers. The company's SIC code 4024 which is assigned to regulated natural gas distribution industry. The company is rated on the basis of financial- and qualitative fundamentals.

4.1. Financial Statements Only (FSO) Rating and Continuous Term Structure of EDFs

We have analyzed the company's financials by using RiskCalc v3.1EM Model based on the last five year-end figures. Based on the audited financials, we have utilized the two-point estimates for 1- and 5-year EDF estimates and thus achieve a continuous term structure of EDF values. In other words, RiskCalc v3.1 Emerging Markets model users can obtain EDF values for any point between one and five years. In addition, RiskCalc v3.1 provides EDF values for alternative definitions, such as the forward EDF credit measure and the annualized EDF credit measure, as shown in Table 3.3.3.1a and 3.3.3.1b.

Table 3.3.1a: Term Structure of EDF Credit Measures

EDF	1-Year	2-Year	3-Year	4-Year	5-Year
Cumulative	0.65%	1.52%	2.49%	3.54%	4.63%
Forward	0.65%	0.88%	0.99%	1.07%	1.13%
Annualized	0.65%	0.76%	0.84%	0.90%	0.94%
Adjusted PD	0.65%				

Source: Moody's Analytics (Rating Report Results)

A cumulative EDF credit measure gives the probability of default over that time period. For example, a five year cumulative EDF credit measure of 4.63% means that that company has a 4.63% chance of defaulting over that five year period. The second column in Table 3.3.3.1 provides an example of the cumulative 1- to 5-year credit measures produced by the model. The forward EDF credit measure is the

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conditional probability of default between t-1 and t, conditional upon survival until t-1. In other words, the five-year forward EDF measure is the probability that a firm will default between years four and five, assuming the firm survived to year four. The annualized EDF credit measure is the cumulative EDF value for a given period, stated on a per-year basis. The EDF of our company in Turkey gets a Bond equivalent default rating of Baa3 for a rating horizon of one year only, which is the border for investment grade rating. The company reveals a migration to sub-investment grade Ba1 within the next 5 year period.

Table 3.3.1b: EDF Mapping to Bond Rating

	1-Year	5-Year
Expected Default Frequency (EDF)	0.65%	4.63%
Bond Default Rate Mapping	Baa3.edf	Ba1.edf
Percentile	13.69%	16.21%
Organizational Rating	Green	

Source: Moody's Analytics (Rating Report Results)

4.2. Relative Credit Risk Drivers Map

The RiskCalc v3.1 application also provides an analytical tool to estimate the relative risk contribution of each risk variable. This superb tool is useful in identifying the financial strength and weakness of a company. The Relative Contribution graph indicates the ratios that help to increase default risk, the ratios that help to decrease default risk, and their relative magnitudes, which are very much strategic management parameters for a company. For example, in Exhibit 4, the Liability structure of the company acts as the largest risk contributor among all the ratios, whereas, all other risk drivers such as Inventory to Sales, or Ebitda to interest expense help reduce default risk of the company. The management has to find solutions with respect to restructuring the debt composition of the business.

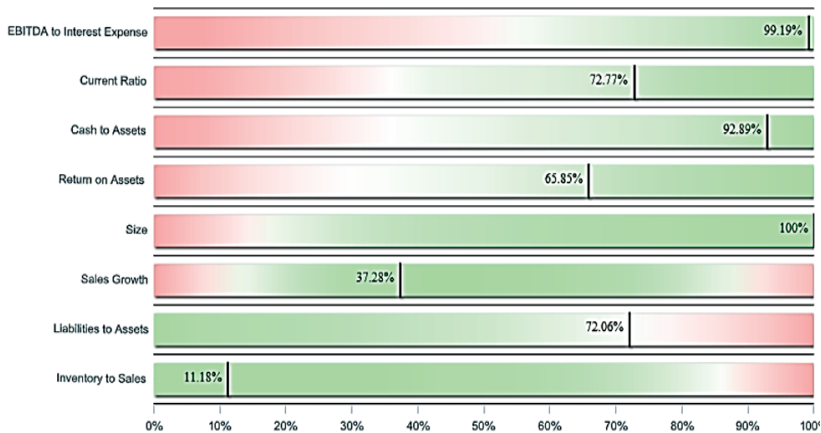**Exhibit 4: Relative Contribution Graph of Risk Drivers**
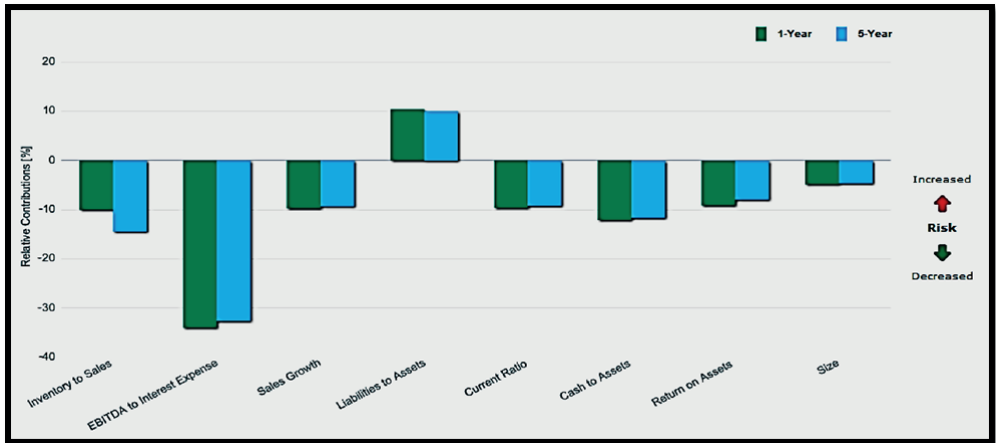
Source: Moody's Analytics

4.3. Percentile Map of Risk Drivers

The percentile map feature allows users to quickly isolate the problematic ratios for a given company. As shown in Exhibit 5, each horizontal bar represents a ratio labeled on the left (e.g., Sales Growth).

Exhibit 5: Risk Drivers Heat Map

Source: Moody's Analytics (Rating Report Conclusions)

The percentage number within the horizontal bar graph represents the percentile of the ratio within the development sample (e.g., 81.59% of the development sample had Sales Growth less than 50%). The shading represents the risk level associated with the ratio: green is low risk, red is high risk, and grey is neutral risk. Our

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Natural Gas Company is very much strong on the level of Size, Inventory Management and Profitability, whereas the liability structure and the potential to grow the turnover causes very much concerns to the management of the company.

4.4. Qualitative Factors Analysis

The qualitative factor analysis reveals itself on the factors of Industry, Market, Company and Balance Sheet Factors. The default probability based on both the RiskCalc EDF (0.65%) and Qualitative Score gives us a combined final Pd rate of the company of 0.77%, which is Ba1. As depicted by the increasing Pd level, the company migrates from Investment Grade to Sub-Investment Grade due to the weak fundamentals of qualitative factors.

4.5. Rating Adjustments Based on the Regulated Electric and Gas Utilities Model (Ba Rating Level)

Based on the rating criteria of the REGU-Model, the company in Turkey would be rated on the following criteria (Moody's Analytics 2017 pp. 29-37):

Factor 1a: Legislative and Judicial Underpinnings of the Regulatory Framework

Utility regulation occurs (i) under a national, state, provincial or municipal framework based on legislation or government decree that provides the utility a monopoly within its service territory, but there is a reasonably strong rule of law.

Factor 1b: Consistency and Predictability of Regulation

We expect that regulatory decisions will demonstrate considerable inconsistency or the regulator may have a history of less credit supportive regulatory decisions with respect to the issuer.

Factor 2: Ability to Recover Costs and Earn Returns – Ba Rating Level

There is an expectation that fuel, purchased power or other highly variable expenses will eventually be recovered with delays that will not place material financial stress on the utility, but there may be some evidence of unwillingness by regulators to make timely rate changes to address volatility in fuel.,

Factor 2b: Sufficiency of Rates and Returns – Ba Rating Level

Rates are (and we expect will continue to be) set at a level that generally provides

recovery of most operating costs but return on investments may be less predictable, and there may be decidedly more instances of regulatory challenges and disallowances, but ultimate rate outcomes are generally sufficient to attract capital.

Factor 3: Diversification

A typical utility company operates in a market area with somewhat greater concentration and cyclicality in the service territory economy and/or exposure to storms and other natural disasters, and thus less resilience to absorbing reasonably foreseeable increases in utility rates.

Factor 4: Financial Strength

1.	CFO pre-WC + Interest / Interest	2.0x - 3.0x
2.	CFO pre-WC / Debt	5% - 13%
3.	CFO pre-WC -Dividends / Debt	0% - 9%
4.	Debt / Capitalization	55% - 65%

When we examine the annual issuer-weighted corporate default rates of Moody's between 1920 and 2019, the average default probability of the Ba rating is 1.01%.

The grid in this rating methodology represents a decision to favor simplicity that enhances transparency and to avoid greater complexity that might enable the grid to map more closely to actual ratings. Accordingly, the four rating factors and the notching factor in the grid do not constitute an exhaustive treatment of all of the considerations that are important for ratings of companies in the regulated electric and gas utility sector. In addition, our ratings incorporate expectations for future performance, while the financial information that is used in the grid in this document is mainly historical.

4.6. Difference between RiskCalc v3.1 Emerging Market Modelling and Regulated Electric and Gas Utilities Model

Rating grades are a very important factor for the effective functioning of the global economy as rating provides an objective assessment for each actor of the financial system. Rating agencies develop various rating methodologies for different purposes as evaluating companies. Beyond that, the same rating company can use different rating models, which it has developed to evaluate a company. As shown in previous chapters, two different models, which is developed by Moody's, were

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used to evaluate the Regulated Electric and Gas Utility in Turkey whose business is predominantly the sale of natural gas or related services under a rate-regulated framework to retail and corporate customers.

REGU-Model of Moody's provides general guidance that helps market participants understand how qualitative and quantitative risk characteristics are likely to affect rating outcomes for companies in the regulated electric and gas networks industry. This model mostly emphasizes qualitative factors such as legal regulations, market share, generation and fuel diversity, recover cost and earn return. Some of these factors, especially legal regulations, are not at the initiative of the companies, and changing some of them requires a long time. Therefore, it can be said that the REGU-Model is more suitable for evaluations that require a long-term perspective.

Another model is EDF that derives its value from the market value of assets, asset volatility and the distance to default. The model is based on financial data and market value. Therefore, the model is very sensitive to momentary market changes.

5. Conclusions

The decision about to choose the appropriate rating model is a delicate and strategic issue even though the model is provided from the same source rating company. Because rating companies develop different models for different purposes and so many different models may end-up in different degrees of rating and effect the final PD of the company, the end-user such as a bank might be involved in "rating arbitrage" situation for the same class of obligor or a facility. Though, this might be considered as "Rating Arbitrage" in terms of capital adequacy calculations, the purpose of the "rating" would hinder this dilemma. The moment of truth lies in the purpose of usage for rating. Hence, the users of rating should understand very well "what is rated" and "how is rated". If these twin objectives are not clarified, this can result in hazardous and inefficient conclusions for the principals or rating. As depicted by two different models, a company's rating can depend on financial data and many other drivers. These factors can affect each other positively or negatively. Additionally, time period and the country of origin are important factors for the same rating model.

In our case, two different models of Moody's had been used. In EDF model for the company in Turkey, while financial data and market value based PD ratio for 1-year was calculated as 0.65%. This corresponds to Baa3 level in terms of Moody's and when this PD is combined with qualitative factors, final PD ratio of company in-

creases to 0.77%. This level corresponds to Ba, which indicates us a "downgrading". Thus, the company we rated migrates from Investment Grade to Speculative Grade. In REGU-Model, company in Turkey is rated with Ba, which is Speculative Grade and its PD ratio is 1.01%.

In summary, we can reach the following conclusions:

- Each rating model is developed by rating agencies for different purposes and the user should be aware of this situation. The awareness could be improved by advanced level training workshops.

- A firm does not have an absolute correct rating within the same period because each rating model uses different criteria, parameters, models and methods.

- We need to choose the appropriate rating model to make accurate analysis and minimize risks for providing correct information on different user types and levels, which requires extensive amount of consultancy.

- The usage of rating for capital adequacy purposes by banks should be in a conservative mindset. This would also put an end to "rating arbitrage".

- EDF might provide extensive, just in time information to the agency ratings, which are less volatile in terms of final judgements.

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Appendix A: Financial Strength Factors Based on Rating Classes

Factor 4: Financial Strenght									
Weighting 40%	Sub-Factor Weighting	Grid Type	Aaa	Aa	A	Baa	Ba	B	Caa
CFO pre WC+interest/	7.50%		≥8.0x	6.0x-8.0x	4.5x-6.0x	3.0x-4.5x	2.0x-3.0x	1.0x-2.0x	<1.0x
CFO pre WC/ Debt	15%	Standard Grid	≥40%	30%-40%	22%-30%	13%-22%	5%-13%	1%-5%	<1%
		Low Business Risk Grid	≥38%	27%-38%	19%-27%	11%-19%	5%-11%	1%-5%	<1%
CFO pre-WC - Dividends/Debt	10%	Standard Grid	≥35%	25%-35%	17%-25%	9%-17%	0%-9%	(5%)-0%	<(5%)
		Low Business Risk Grid	≥34%	23%-34%	15%-23%	7%-15%	0%-7%	(5%)-0%	<(5%)
Debt/Capitalisation	7.50%	Standard Grid	<25%	25%-35%	35%-45%	45%-55%	55%-65%	65%-75%	≥75%
		Low Business Grid	<29%	29%-40%	40%-50%	50%-59%	29%-67%	67%-75%	≥75%

Source: Moody's Rating Methodology, Regulated Electric and Gas Utilities (10 August 2009, p.17).

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