Do Credit Ratings See Through Business Cycles?

ΡΑΠΤΟΠΟΥΛΟΥ ΟΛΓΑ

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ABSTRACT

This paper studies the structure and performance of credit rating agencies and their interrelation to business cycles. In particular, using the one year default likelihoods, estimated with the Merton's model of distance of default and two more factors, the data are presented in graphs for 32 firms at an attempt to depict evidence of procyclicality and question the ability of credit rating agencies to see through the business cycles. Utilizing monthly data from the Bloomberg database for these firms we find only small evidence of procyclicality, which do not follow a specific pattern. However, their performance still raises questions for some cases about their methodology of rating through the cycle. Thus, the causes of the underperformance which is shown need to be reconsidered and other factors should be taken into consideration.

Key words: credit rating agencies, credit ratings, business cycle, procyclicality, one year default likelihood.

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INTRODUCTION

"There are two superpowers in the world today in my
opinion. There's the United States and there's Moody's
Bond Rating Service. The United States can destroy you by
dropping bombs, and Moody's can destroy you by
downgrading your bonds. And believe me, it's not clear
sometimes who is more powerful."[1]

This statement was made by mr. Thomas Friedman, a columnist at New York's Time, awarded with Pulitzer price. Though being more a political statement than a financial one, it completely summarizes the ongoing debate around credit rating agencies.

In the light of the current financial crisis, regulators of the financial system have been debating about the causes of what turned out to be the most severe crisis of the century and they particularly blame the credit rating agencies for their inadequacy to predict the crisis and the bad judgments as far the rating of structured products is concerned.

But literature, concerning the credit rating agencies and their performance is not something new. The same debate appeared when the Asian crisis arose in 1997. By that time the credit rating agencies had done little to foresee the Mexican crisis, as well.

So, why credit rating agencies consistently underperform, while stating that their ratings are looking forward and they rate through the business cycles?

This thesis is trying to explore and explain this weakness of the credit rating agencies and explore the existence of procyclicality which could trigger such incidences? It is structured as follows: in the first chapter the bigger picture of the structure of the financial system is presented. The second and the third chapter include presentation of the structure and methodologies of the credit rating agencies, while providing existing literature on their performance in the light of macroeconomic factors. The last chapter present our empirical model, which gives some insight into the subject while raising more questions to be viewed and examined in the future.

CHAPTER ONE

THE BIG PICTURE: THE FINANCIAL SYSTEM

1.1. STRUCTURE OF THE FINANCIAL SYSTEM

The main sources of external funds for businesses around the world include bank loans (method which is used by the vast majority) non bank loans, bonds and stocks. Bonds and stocks, which together are also called marketable securities, present direct finance, while bank and non bank loans involve intermediaries and depict indirect finance.

For these sources of financing and for the financial system in general, there are some facts that are the reasons for the current structure of it.

The first fact can be summarized as follows. Indirect finance, as a way in which business raise funds for their activities, is the most significant source of financing compared to direct finance. Banks, in particular, are the primary source o external funds. Even though there is much attention focused on bonds and stocks markets, they are used by the minority of the business. More specifically, only large, well established corporations have easy access to securities markets to finance their activities, according to Mishkin.

The second fact notes that the financial system is among the most heavily regulated sectors of the economy.

Furthermore, collateral is an essential and important feature of debt contracts.

Lastly, debt contracts are complicated legal documents, which impose terms and restrictions to the behavior of the borrowers

1.2. THE ROLE OF THE GOVERNMENT

The most basic role that the government has, which is also a minimum part of its functions, is the control of the use of force. On a second level and equally important role plays the ability and obligation of the government to establish laws, which serve the citizens interests, which also consists a unique power of the government. A legitimate government is the government which does not exempt itself from abiding by the law, which is a feature mostly for democratic governments, but is not common for other forms of governments. The government, which is legitimate, is thought to be able to pursue public goals, promoting the citizens welfare.

As far as the economy and the business activities are concerned, it has been historically recorded that government intervention has been clearly important and dominant for most of the times in history. It has also been recorded that at the first stages of the growth of the developing countries, the government and the business class had strong bonds, as the power was in the hands of the minority, which were also the privileged ones, and those who governed were also the ones who developed business activities. That fact had as a result the creation of distorted incentives as far as the political and business decisions are concerned. That is the main reason why the successful governments have separated their roles in relation to business and the financial markets are developed without government intervention.

1.3.   FINANCIAL SYSTEM AND THE ROLE OF THE GOVERNMENT

The financial system serves as the intermediary between savers, who have surplus of savings and borrowers, who make investments Primary function of the financial system is the issuance and safeguarding of money. However, through the course of time, several functions of the financial system evolved, since it still constitutes a payment mechanism, which offers such services minimizing costs and dangers. This function is mostly provided by the banks, but it is also provided by the seciurities markets.

The institutions that the government creates or influences are essential for the operation of the financial system. The most important feature is the rule of law. The banking system is based on regulation, in order to provide its services in an effective way.

An equally important element is information. The banks use private information, which is provided by the firms, and channel the capital of the savers to healthy investments. On the other hand, the information provided to the securities markets must be public in order to perform this function. Even though some economists consider that government intervention is of minor significance, because it is in the interest of the firms which participate in those markets to provide all the necessary information in order to attract investments, the regulations that the government imposes help protecting the investors,.and making choices with the best information provided.

A third element in which the role of the government is important is the provision of sound currency, while lastly the regulations on the banking system and the monitoring procedures contribute to the healthy function of the financial system and the economic growth.

1.4.   SUPRESSION OF THE FINANCIAL SYSTEM

However, not all governments provide the above mentioned services, while the mechanisms of government intervention they use suppress the growth of the financial system.
The ways in which the government intervenes in the financial system are the following:

1. By imposing ceilings to the interest rates of deposits
2. By obliging banks to keep higher reserves
3. By lending and favoring some industries over others and by manipulating the banking credit in favor of these industries
4. By owning banks or by managing banks, leaving them with no autonomy
5. By setting barriers to entry in the financial system, mostly as far as foreign organizations are concerned
6. By influencing the free capital flow

The ceilings at the interest rates and the obligation of keeping high reserves in the Central Bank with no interest or very low interests have as a result higher interest rates for the borrowers and the suppression of credit, while the very low interests that banks pay to the depositors, who are mainly

affected by these measures, come as a result as the banks channel this cost of these constraints to them.

The intervention of the government in the banking system, as described in points 3 and 6, leads only to temporary growth, creates wrong incentives in the markets, serves only political purposes and creates obstacles for the healthy development of the banking system, as among others by restricting foreign investments in the banking sector, it is prevented from developing the essential infrastructure and know- how and further and further burden the savers.

Quantifying the consequences of these practices constitutes a challenging procedure, but is rather revealing as far as its results for the growth of the developing countries are concerned.

1.5. LIBERALIZATION OF THE FINANCIAL SYSTEM

Even though the traditional economic theory (e.g. Keynes) did not include the financial organizations in the models it presented or favored government intervention, in order to secure sustainable development, during the last decades, this perception has radically changed, as economists have proved that the development of a sound banking system has significantly contributed to the economic growth and welfare of the countries.

The basic principles of corporate governance argue that the economic growth must be accompanied by the increase in the value added. Public companies failed for a number of reasons, which are summarized as follows: there were multiple goals, which were most of the times contradictory, the monopolistic character of the public firms, very low incentives for sustainable growth, while the free access to capital gave them no incentives to reform and operate effectively. There are a lot of historical examples of countries which underwent this transitory period and pursued massive privatizations which changed the course of their development. Such examples include the examples of East Germany, Russia, Poland etc.

The liberalization of the financial system followed these features:
1. Elimination of the tight controls in the interest rates

2. Decrease in the reserve requirements for the banking system

3. Decrease in the government intervention in the banking sector

4. Privatization of public banks

5. Development of competition in the banking sector through the elimination of the entrance barriers

6. Capital liberalization

Therefore, it can be stated that a sound financial system based on the private initiative along with the effective regulatory frame and legislation by the government are vital for the operation and monitoring of the markets.

1.6.   LEGAL FRAMEWORK

Financial markets are based on the function of the legal system in four general ways: property rights, contracts, companies (establishment and enforcement of company law) and finance (e.g through laws and regulations which are set for the securities market and other financial procedures).

First of all, the most important condition not only for the function of the financial markets but also for the whole system is the prevalence of the rule of law, as already stated in the previous section. This means that everybody are governed by the same rules, with no exceptions (the government is not exempt either!). The rule of law in order to hold needs to be feasible, not too costly for individuals to use the legal and political system, which practically means an effective legislative body and a complete judiciary system. There seems to be a significant connection between the rule of law, the confidence in government and the prosperity of the economy.

Corruption exists when the rule of law is deeply undermined, because corruption is mainly about illegal payments and favors (mostly to public services and to politicians). Corruption can also be considered as a kind of tax collection by public officials which ends up being distributed to themselves. It eventually passes out to consumers through higher prices and all the surveys which have been made, prove that corruption leads to more severe negative effects than those of ordinary state inefficiency. Some studies, specifically, show that corruption affects economic growth and the most significant channel for this effect is through capital investment (F.D.I etc) especially in emerging markets. The example of the corrupted government of Indonesia, the Suharto government,

is very characteristic of the effects of corruption to economic growth. Once, during his governance it was spread a rumor that his health is seriously deteriorated and the stock market responded immediately and remarkably to the rumor, as the listed companies which had political ties with the government suffered large declines in their stocks up to 16% of the market value of the firms!

Nevertheless, despite the studies and the official initiatives and agreements of the most important international institutions, such as IMF and OECD, governments of developed countries or multinational institutions continue to reward corruption and corrupted governments in practice with high levels of economic aid. USA actually among these developed countries rewards corruption the most while, on the other side, Scandinavian countries penalize corruption the most.

Let us now shed light to some specific elements of law which make it possible for the financial markets to allocate capital to its highest uses. We can separate them in two big categories, those elements of law which aim at shareholder protection and those aimed at credits protection.

1.7. SHAREHOLDERS PROTECTION

There is significant number of laws which all ensure that all shareholders are treated equally and are protected against all kinds of expropriation. Laws for minority protection, ensure that the shareholders outside the controlling groups receive all the information needed and are treated fairly and are able to evaluate and control the managers. Accounting standards and disclosure laws were made in this direction. In fact, disclosure laws also involve nondisclosure of information, which is considered inside information and can lead to stock price manipulation of any kind or mislead about the status of the company. Inside trading, stock price manipulation and pyramid schemes are examples of fraud in security markets for which there must be strong law protection.

As far as the principal-agent problem is concerned (the interests of the managers versus the interests of shareholders) it is dealt by shareholder voting (successfully or not remains to be seen and examined!). Some countries in their regulations enforce the principle of one-share and one vote. Some countries recognize proxies and other voting processes or cumulative voting and there are countries, like USA, which give other kind of redress to minority shareholders in order to be heard.

1.8.   CREDITORS PROTECTION

Creditor protection involves mainly laws, which deal with the possibility of not keeping debt covenants or not being able to pay. It also includes laws concerning property rights and collateral, which make financing more available. Bankruptcy laws are used to set the procedure which leads to the liquidation of non viable firms or to the restructuring of viable ones, and thus try in this way to resolve the problem of debt defaults. However, because it is not always easy to separate the viable firms from the non viable ones and it is difficult to set a balance between protecting creditor's rights and protecting viable companies, there are bankruptcy procedures in some countries which tilt too far toward debtors and others which tilt too far forward creditors. The most noticeable and clear example of a bankruptcy system strongly biased in favor of debtors, is that of the USA. On the other hand, France among the European countries has a bankruptcy system, which tilts strongly toward debtors.

In conclusion, it should be stated that there are numerous studies that relate, prove and explain banking development and long-run economic growth with the creditor rights and legal enforcement variables and they all conclude that legal protection for shareholders and creditors matters for economic performance.

1.9.   ASSYMETRIC INFORMATION: THE LEMONS PROBLEM THEORY

Asymmetric information in the financial system is a problem which has been most successfully described by Akerlof and has been introduced in the "lemons theory", which capture the nature of it and summarizes its function, and the presence of transaction costs.

First of all, it is clear that intermediaries were initially developed to productively channel the funds of savers to individuals and business with investment opportunities, minimizing in that way the transactional costs of the savers and investors. As a result, an investor who has a small amount to invest, through intermediaries (banks, venture capital firms e.t.c.) broadens his investment choices and at the same time minimizes the transactional costs needed to make this investment, by taking

advantage of the economies of scale and the expertise of the intermediaries. But this is where asymmetric information comes along.

The «lemons» problem, as it is known, describes the asymmetric information problem using the used cars markets and is as follows: In the used cars market, there are owners who have good cars and those who have «lemons» and are more than willing to sell them. However, due to asymmetric information, in this case meaning that owners know a lot more about their cars than the potential buyers, the prices are lowered so much that the owners who have good cars are not willing to sell and in the market remain only the bad cars. The buyers, who know the existence of the two categories, cannot tell between them due to lack of information and expertise. They do know, however, that with so low prices the only category which is still willing to sell is the owners of bad cars, so ultimately they will not buy any car. Thus, due to asymmetric information in the form of adverse selection problem some markets close off altogether. The rational is the same for financial market as well. In financial markets there are high quality borrowers, which are low risk borrowers, and low quality borrowers, which are high risk borrowers meaning that they are willing to pay higher interest rates. So in this case lenders realize that imposing higher interest rates above a certain level, would close the high- quality borrowers off the market.

1.10. EFFECTS OF ASYMMETRIC INFORMATION

As already stated, asymmetric information is the main information problem of financial markets. Literature on information problems in financial markets records four implications, especially relevant for emerging financial markets:

1. asymmetric information drives the market towards debt instead of public equity. Debt contracts are clear, the obligations are fixed no matter how well or bad the company performs and debt holders are in stronger position than the equity holders in an economic environment with imperfect information. However, countries with advanced regulatory systems and strong legal structures, are those with the most developed equity markets.

2. in the accordance with the above mentioned implication, it could also be stated that asymmetric information leads to banks rather than securities, such as bonds, notes and commercial paper.

3. furthermore, as far as bank debt is concerned, asymmetric information pushes toward short-term debt and away from long-term debt.
4. lastly, asymmetric information favors secured loans over unsecured ones.

In order to control and constrain the effects of asymmetric information, an investor has to perform two tasks: screening and monitoring.

1.11. ADVERSE SELECTION PROBLEM

Screening is performed before the investment is made. It is subject to the adverse selection problem. The adverse selection problem is succesfully described by Akerlof, who examines the market of used cars, as already seen above. In the case of financial markets adverse selection problem has two implications. It makes debt markets more expensive, as high quality borrowers pay higher interest rates due to the existence of low quality borrowers, and in some cases it excludes borrowers above a certain level of risk. In equity markets the adverse selection problem is more intense and clearer as the owner of the company knows a lot more than the investor, so the companies attempt to signal that their quality is higher than the average, but sometimes a company's decision to sell stock to the public may signal that its status is worrying or may even be leading to bankruptcy. Due to this problem some markets will not function at all and in any case they will not be preferred as a source of financing. This existence of asymmetric information explains why the security markets are not important source of financing.

A solution to this problem is to provide individuals or businesses, which invest in these markets with information about the firms, so that they can distinguish between good and bad firms through private companies (Moody's S&P) or analysts. However, the problem that occurs in the implementation of this solution is the free rider problem. That means that people who do not pay for information take advantage of the information that other people have paid for. Ultimately, the people who purchase information lose all the advantages that they have gained from this 'privileged" information and stop buying it.

The free rider problem is overcome in two ways. First of all, the regulations that governments impose to the securities markets make the firms that are traded in these markets reveal information about themselves. In fact, asymmetric information problem through the above described way explains why the financial system is among the most heavily regulated sectors of the economy.

Secondly, financial intermediaries, such as banks, produce information and lend to good firms avoiding the free rider problems because of making private loans instead of investing in securities traded in the open market. This is the main reason why indirect finance is used widely and is more important than direct financing. Furthermore, in this way the importance of the banks in the financial system is noted, as they hold mostly non traded loans. Lastly, the analysis of adverse selection problem explains why only large, well established companies are traded in the security markets, as it is easier to assess the quality of a corporation, which is large and better known.

It is then obvious, that by securing the investment a lender is willing to make with collateral or by imposing restriction covenants to the borrowers reduces the effects of adverse selection problems.

1.12. MORAL HAZARD PROBLEM

On the other hand, the asymmetric information problem continues to exist after the transaction has occurred and is called moral hazard. It should be mentioned, however, beforehand that moral hazard can exist without the presence of adverse selection problem.

The type of moral hazard that affects equity contracts is called the principal-agent problem. This type is described as the problem which occurs when the management of the firm is not in the hands of the shareholders (the majority) but in the hands of the managers (the minority), who, for their own interests, withhold information from the shareholders and pursue their own goals. The solutions to the moral hazard problem in this case include government regulations (standard accounting principles e.tc), monitoring the activities of the managers, which is costly, and financial intermediaries, which can help reduce the moral hazard problem (e.g venture capital firms). Another way to avoid moral hazard problems is instead of making equity contacts make debt contracts. In this way it will be less costly to monitor the firm and there will be less need to implement government

regulation. Although debt contracts have more advantages than equity contracts they as still subject to moral hazard. Reducing moral hazard by securing the debt contracts with collaterals, by implementing restrictive covenants and monitoring the activities of the borrower lessen the effects of moral hazard.

In more details, monitoring is the second task that investors are obliged to do and it involves the continuous follow up of their investments. In developed countries, such as USA, monitoring problems take the form of the principal agent problem, as management is separated from shareholders, but is mostly solved by a combination of disclosure laws and well enforced shareholder rights. In emerging financial markets this is not really the case, since most of the companies are family owned and controlled or in the hands of wealthy individuals and there are conflicts between inside and outside shareholders and between debt holders and equity holders. These problems, such as tunnelling and increasing risk at the expense of the creditors, are all forms of moral hazard. In these cases, creditors can protect themselves by holding short term debt or by imposing restrictive covenants, such as a negative pledge clause (eg. if debt is unsecured then the company is obliged not to secure any new debt that is going to be issued). Of course, these covenants do not have any meaning without monitoring procedures and enforcement.

1.13. SOLUTIONS TO THE ASSYMETRIC INFORMATION PROBLEM

Since monitoring and screening are very difficult, demanding and costly procedures, financial institutions have undertaken these tasks, creating, however, a new problem of how to monitor the monitors.

Banks, among the other financial institutions, dominate in emerging financial markets by gathering information on a regular basis and eliciting private information in particularly. They balance screening and monitoring costs by charging interest rates and fees. They play a significant role as specialists in information processing and contract enforcement, as long as they proceed with their activities in an efficient way and use prudently a combination of debt and equity financing. In this case, asymmetric information exists in the depositors side. The mechanisms that secure bank

monitoring are market based monitoring and control and control from regulatory monitoring and control. Market based discipline is enforced by depositors and is channelled through the fear of bank run due to massive withdrawals of their deposits. On the occasion of a bank run, there is always danger that small and uninformed investors can lose their money. That is why governments of industrial and developing countries have guaranteed some or all bank deposits. Regulatory discipline is enforced by the government itself, which monitors banks periodically and has set procedures capital requirements and other prudential regulations.

Institutional investors, which include insurance companies, pension funds, mutual funds and private equity funds, perform screening and monitoring as well, but mainly in the securities markets. They are important because they buy in large quantities and economize in this way on the physical costs of selling, they maintain contact and share information with investment bankers and lastly they play role in corporate governance.

These institutional players, however, use not only public but also private information in order to perform screening and monitoring. Furthermore, their evaluations are not meant to be publicly used. In order to disseminate information, there are various institutions of information, which help investors perform screening and monitoring.

First of all there are numerous disclosure rules which are forced and applied in the securities markets, which consist a certificate that the companies involved in these markets will fully disclose all the necessary information.

Furthermore, accounting firms and auditing firms are another extremely important source of information. Most countries have laws that introduce and enforce commonly used standards for all firms. Some standards are based on General Accepted Accounting Rules (GAAP), while others are based on International Accounting Standard Committee (IASC) or International Financial Information Standards (IFRS).

The financial press should be also taken into consideration, when talking about sources of public information.

Of course, where there are stock markets, there are also stock analysts, who additionally provide public information for investors and their recommendations about the markets and the stocks.

Last but not least, there are specialized agencies, the credit rating agencies, which provide their opinions, summarising them in a single letter (see table 1 in the annexes). The next chapter presents in details their structure and functions.

CHAPTER 2

CREDIT RATING AGENCIES (CRAs)

2.1. DEVELOPMENT OF THE CREDIT RATING INDUSTRY

The credit rating industry is a well developed and established market, for which in the light of the current crisis there is an ongoing debate, concerning its use and effectiveness. Let us see how this industry started to develop.

The first establishment of an agency, which was the precursor of the modern credit rating agencies, dates back to 1837 by Louis Tappan, owner of a silk business, who kept detailed credit information about his customers, which included many large commercial enterprises and in 1841 established The Mercantile Agency. In 1859 the first publication of ratings guide takes place and concerns the rating of merchants according to their ability to pay. By 1890, Poor's Publishing Company (S&P's predecessor) was publishing the 'Poor's Manual', which included analysis of various types of investments, including bonds. It should be mentioned that at the time being the most developed bond market was the railroad bonds market. That is why the first credit ratings ever assigned concern this particular market. Since then the expansion of the sector came rapidly.

John Moody started to rate US railroad bonds in 1909 in his book Analysis of Railroad Investments, being the pioneer, as he was the first to grade bonds with a single letter, which incorporated the credit analysis he made. Moody's Investor Services was established in 1914 and its first formal rating department was created in 1922. Poor's Publishing Company released its first ratings publication in 1916, Standard Statistics Company in 1922 and Fitch Publishing Co in 1924.

At the early stages of the development of the market, the agencies charged the investors for the services they provided, which consisted the main source of their revenues. Their presence became more and more important for the function of the bond markets. When the Securities and Exchange

Commission (SEC) was established in 1934, it began setting requirements to corporations to issue standardized financial statements. During the same period and in the aftermath of the 1929 Great Credit rating agenciesh, which was extremely severe and its impacts were without precedent, bank regulators adapted in 1931 a set of rules, which prohibited banks from investing in speculative securities (or non investment securities or more commonly named as junk securities), as determined by credit rating agencies. That was the first time credit ratings were used with the blessing of the official regulators in the most formal way and since then they are systematically incorporated in the regulation framework of the financial markets.

Furthermore, over time, the credit rating agencies continued to expand by using new financial instruments and the biggest agencies started rating not only long-term sovereign and corporate bonds but also a variety of other financial instruments such as preferred stocks asset-backed securities, medium-term note programs private placements, commercial papers, counterparty risk posed by derivative products, the claims paying ability of insurance companies and price volatility of mutual funds and mortgage-backed securities.

. From the mid-1970s to today, credit rating agencies have become significantly bigger in size. The modern credit rating agency has more influence on the markets and is more profitable than at any time this century, despite the fact that the rating system has not changed in any substantial way since the 1930s. The rating scales also are similar to those used during the 1930s (see annex, table 1). Their demand increased so rapidly that these US agencies since the mid 80's have established offices all over the world in order to meet the demands of their clients overseas besides the non-US agencies that were established as well.

2.2.   CREATION OF NRSROs

As pointed out in the previous section, credit ratings were officially incorporated in formal rules in 1931. Until 1970 the dependence of the regulatory framework had not changed substantially. But since then ratings started being incorporated in numerous rules and regulations. As Frank Partnoy (1999)[2] reports that the cascade of regulation began in 1973 when, following the credit crises of the early 1970s, the SEC adopted Rule 15c3-1, the first securities rule formally incorporating credit

ratings and thereby approving the use of certain credit rating agencies as Nationally Recognized Statistical Ratings Organizations (NRSROs). Rule 15c3-1 set forth certain broker-dealer "haircut" requirements, and required a different haircut for securities based on credit ratings assigned by NRSROs.

Although there seem to be around 150 local and international credit rating agencies worldwide[3], Moody's, Standard and Poor's and Fitch are clearly the main players in the sector, operating in an international basis and were granted the approval as NRSROs as soon as the SEC created this category. Until 1975 the SEC had designated only another four agencies as NRSROs, but because of mergers among the entrants and with Fitch (IBCA) the number of the designated agencies remained the same. It was already 2003, when SEC decided to designate the fourth NRSRO agency, Dominion Bond Rating Services (a Canadian agency) and in 2005 A.M. Best, an insurance company rating specialist, was also included in NRSROs. It should be noted, however, that SEC all this period was not obliged to reveal the criteria it used to decide for the designation process, thus there was not standard procedure for the designation and the whole process was opaque.

By the early of 2010 the total number of NRSROs has reached ten. This was a gradual result of the response to the Credit Agency Reform Act in 2006, which specifically demanded from SEC to follow more transparent procedures and set the criteria for the designation process that SEC should follow, leaving it with limited powers, as the Act considered that the SEC was a barrier to entry for the rating agencies market.

2.3.   STRUCTURE AND ACTIVITIES OF CRAs

Credit rating agencies publish ratings and evaluate the creditworthiness of issuers (firms, countries etc) and the credit quality of specific debt instruments. Despite similarities among rating agencies in general, the types of issuers and issues/securities they rate, the ways in which they assign their ratings and how they interpret these ratings can be different. Some rating agencies provide their services for specific fields, regions, sectors, and/or asset classes, while others maintain global coverage and provide ratings across all sectors and asset classes (see table 1 in the annex which provides an indicative selection of rating agencies today).

Credit rating agencies assign ratings to issuers, including corporations, governments, and public finance entities, that issue debt securities, as well as to specific issues, such as bonds, notes, and structured finance instruments.

Some major differences among rating agencies, which are explored in the following parts of this section, include:

- The methodologies/approaches they use in credit risk assessment
- Their range of coverage
- The business models under which they function

Some credit rating agencies, including major global agencies like Standard & Poor's, are publishing and information companies that assess the credit risk of issuers and individual debt issues. They formulate and publish their opinions for use by investors and other market participants who may evaluate credit risk in making their investment and business decisions. Credit rating agencies are considered to be independent providers of opinions on credit risk. While investors and other market participants can also assess credit quality to the extent of their capacities, rating agencies can generally perform credit analyses more efficiently and economically than other firms because they specialize in that activity and channel substantial resources to it. Moody's is the only free standing company.

Credit rating agencies use different business models to charge for the services they provide. The first one is known as the issuer-pay model and the other as the subscription model. Under the issuer-pay model, rating agencies charge issuers and a fee for providing credit ratings. As part of the rating process, these rating agencies obtain from issuers information that might otherwise be unavailable to investors and other market participants and incorporate them into their ratings, which mirror their opinion on the credit quality of issuers. Since the issuer pays for the ratings, the agencies provide these ratings to the market free of charge. Critics of the issuer-pay model argue that there is a potential conflict of interest when rating agencies receive payment from the issuers for which they make their evaluations.

Some credit ratings agencies (being, however, the minority) use a subscription model and charge investors and other market participants a fee in order to gain access to their agencies' ratings. Supporters of this model argue that because these agencies are paid primarily by investors rather than issuers, they are therefore unbiased in their assessment of credit risk. Critics of this model, however, point out that large investors who subscribe to a rating service, especially big investors such as hedge funds who have long and short positions in a variety of securities, may influence the agency's rating results since it is always in the investors' interest to have the favourable ratings in order to support their investment strategy. Furthermore, they note that these ratings are available only to paying subscribers, who are generally large institutional investors, as the subscriptions seem to be rather expensive, increasing the asymmetric information problems and not helping in solving them in this way.

2.4.   CREDIT RATINGS AND THEIR ROLE

Credit ratings are opinions about credit risk provided by a rating agency. Credit rating agencies express opinions about the ability and willingness of an issuer to fulfil its financial obligations in accordance with the terms of those obligations. Credit ratings also reflect the credit quality of an issue, such as a bond or other debt obligation, and the relative likelihood that it may default.

While a key component of credit rating analysis is the assessment of historical data, ratings opinions are supposed to be forward looking. In other words, ratings take into account not only the current condition of the issuer but also the potential impact of future events on credit risk.

According to Standard and Poor's, ratings do not measure performance factors, such as market value or price fluctuations and they are not exact measures of the probability that a certain issuer or issue will default but are instead expressions of the relative credit risk of rated issuers and debt instruments. Because the procedure involves future predictions, credit rating is by nature subjective. Moreover, because long-term credit opinions involve so many factors unique to particular industries, issuers, and countries, any attempt to reduce credit rating to a standard and uniquely quantifiable methodology could be misleading and could lead to serious mistakes.

Credit ratings have obtained several uses, besides their main use as a guide for investments. They have been used by mutual funds in order to differentiate their portfolios and limit their "high risk" investments. They have also been included in financial contracts as covenants by debt issuers and investors. Finally, as F. Packer and Cantor state[4](1994), regulators of financial markets and institutions have increasingly used ratings to simplify the task of prudential oversight. Since these regulators have included rules based on ratings, among others, it had to be defined which agencies would be qualified to be taken into consideration.

Credit ratings, as previously stated, are used by several groups, which are presented below in more detail:

- Investors most often use credit ratings to help them evaluate credit risk and to compare different issuers and debt issues when making investment decisions and managing their portfolios. Individual investors, for example, may use credit ratings in evaluating the purchase of a municipal or corporate bond according to their risk profiles. Institutional investors, including mutual funds, pension funds, banks, and insurance companies often use credit ratings in addition to their own credit analysis. Furthermore, institutional investors may use credit ratings to define higher and lower limits for credit risk and investment guidelines. A rating may be used as an indication of credit quality, but investors should always consider a variety of factors, including their own analysis for their assessment and portfolio analysis.

- Intermediaries: Investment bankers, as already seen in the introduction, help to facilitate the flow of capital from investors to issuers. They may use credit ratings to compare the relative credit risk of different debt issues, as well as use them in their pricing procedures for individual debt issues they structure. They may also use them to define the interest rate of the issue. Investment bankers and entities that structure special types of debt issues may look to a rating agency's criteria when implementing their own policies about how to construct different debt issues, or different tiers of debt.

- Issuers, including corporations, financial institutions, national governments, states, and cities and municipalities, use credit ratings to provide independent opinions of their creditworthiness and the credit quality of their debt issues. Issuers may also use credit ratings to help demonstrate and communicate the relative credit quality of debt issues to the financial

markets worldwide. In addition, credit ratings may help issuers predict the interest rate for their new issues. As a general rule, the more creditworthy an issuer or an issue is, the lower the interest rate the issuer would typically have to pay to draw investors. The reverse could be also true: an issuer with lower rating will typically pay a higher interest rate to compensate the greater credit risk assumed by investors.

- Businesses and financial institutions, especially those involved in credit-sensitive transactions, may use credit ratings to assess counterparty risk, which is the potential risk that a party to a credit agreement may not fulfil its obligations. For example, in deciding whether to lend money to a particular organization, or in selecting a company that will guarantee the repayment of a debt issue in the event of default, a business may wish to consider the counterparty risk.

In order to be effective, a rating must at least provide a reasonable rank- ordering of relative credit risks and a reliable guide to absolute credit risk, as Packer and Cantor (1994) also state. Simple tests suggest that relative credit risks are measured with accuracy. However, when measuring absolute credit ratings, the agencies face dilemmas. Their problem can be summarized as follows: whether or not to imply the same default probabilities at every point in time on the grounds of cyclicality only. The data since 1970 reveal that the correspondence of ratings to default probabilities has changed over the years.

Lastly, when examining credit ratings from each agency, agency rating differences can be observed. They are mainly attributed to alternative rating methodologies and the judgmental element in the ratings process, which is described in the following part of this section. These differences among agencies can result, among others, in receiving at least one satisfactory rating as far as a marginal borrower is concerned, thus avoiding a junk bond rating. Significant rating differences are observed in the measurement of credit risks for banks, as well. As far as the mortgage and asset-backed securities are concerned, the agencies seem to provide consultation in order to structure these products and obtain high ratings. As Packer and Cantor notice in 1994, this competition among agencies can undermine the reliability of the ratings, especially for MBSs and ABSs because issuers prefer structures that achieve a given rating with the smallest enhancements and choose rating

agencies with the most lenient credit enhancements, provided that the agencies' ratings carry sufficient weight in the capital markets. This was remarkably verified during the last recession.

2.5.   RATING METHODOLOGIES

The credit rating agencies use their own proprietary rating methodologies for their assessment procedures, as already mentioned above. They assign and publish ratings at the request of the corporations, governments, or any other issuers, and in some cases will also issue ratings without request, the so called unsolicited ratings.

Rating agencies use different methods in forming and publishing their opinions about credit risk. Some agencies use analysts, some use mathematical models, and some use a combination of the two. As rating agency models differ as far as their criteria, processes, and ratings definitions are concerned, users of ratings should consider such differences if they are using credit ratings as benchmarks.

As far as the procedure of rating a security is concerned the agencies follow completely different rating process for unsolicited ratings (ratings which do not occur on the demand of the issuer). However, a standard procedure for solicited rating includes an analysis based on quantitative and qualitative assessments.

The typical process for a new corporate or government rating, described by S&P's, includes:

- Contract. The issuer requests a rating and signs an engagement letter.
- Pre evaluation. The agency forms a team of analysts to review relevant information.
- Management meeting. Analysts meet with management team to review and discuss information.
- Analysis. Analysts assess information and propose the rating to a rating committee.
- Rating committee. The committee meets to review and discuss the lead analyst's rating recommendation and presentation, including the full analysis and rating rationale, and then votes on the credit rating.

- Notification**.** The agency notifies the issuer of the rating and related rationale as a courtesy. It can allow the issuer file an appeal only if the issuer can provide new and significant information to support a potentially difficult rating conclusion.
- Publication**.**

This procedure is also followed, by the majority of the credit rating agencies. Credit ratings for issuers and individual issues are not fixed but can and do change over time. The reasons for the changes differ, and may be broadly related to overall changes in the business environment, or they may be more specifically focused on conditions affecting a specific industry, entity, or obligation, such as adverse business results at a corporation or political instability for a government. As a result, the agency monitors, re-evaluates, and if necessary, seeks to adjust, its ratings based on the best available information.

Credit ratings are meant to be forward-looking expressions of the creditworthiness of issuers and credit quality of issues. As such, to the extent possible, they include as factors conditions that are likely to affect credit risk, such as the anticipated expansions and recessions in the business cycle. At the same time, while ratings are meant to be forward-looking, they should not be considered as measures of absolute default probability but rather as relative indicators of credit risk. Among other things, business cycles can differ considerably in duration and magnitude, making their impact on credit quality difficult to assess beforehand with certainty.

Equally important, credit ratings and the criteria the agencies set are intended to evolve over time to reflect new and sometimes unpredictable situations. The agencies may change or "migrate" (i.e., upgrade or downgrade) their previous ratings to reflect a higher or lower level of creditworthiness of an issuer or credit quality of an issue.

After issuing a credit rating, all the agencies typically monitor for developments that might affect the credit risk of an issuer or issue. The goal is to maintain a current rating by identifying matters that may result in either an upgrade or a downgrade of the rating. Such matters could include changing industry trends, issuer performance, credit enhancements, or other credit risk factors. Analysts review ratings with a focus on potential changes to the elements and factors that supported the earlier

ratings opinion. When appropriate, analysts present recommendations for ratings changes to a Rating Committee for a possible action.

As S&P's analytically states the agencies' monitoring activities may lead to:

- Changing a rating outlook. This occurs when the Rating Committee determines that there is a one-in-three potential for a ratings change based on trends or anticipated risks that may affect creditworthiness for the coming 6 to 24 months.
- Placing ratings on CreditWatch. This occurs when there is a one-in-two likelihood of a rating change in the near term as a result of an event, a significant and unexpected deviation from anticipated performance, or a change in criteria has been adopted that necessitates a review of an entire sector or multiple issues.
- Raising or lowering a rating.

Actions may include credit rating upgrades, downgrades, withdrawals, and suspensions, as well as changes in credit rating outlooks and CreditWatch placements and removals.

Agencies take into consideration a number of different variables in determining the type of monitoring to perform on a particular rating. For example, the frequency and extent of the monitoring period may depend on specific risk specifications that are relevant to an individual, a group, or a class of rated entities. In addition, the frequency of these examinations may be related to the timing and availability of financial and regulatory reporting, transaction-specific performance information, and other new information from various sources.

For corporate and government ratings, it is routine to arrange periodic meetings with management. These meetings with issuers help analysts in staying alert for any changes in the issuer's plans and allow them to discuss new developments, performance relative to prior expectations, and potential problem areas. For structured finance ratings, specialized surveillance analysts monitor performance data and other relevant information.

Agencies change credit ratings in response to events or information that have an impact on the credit risk of an issuer or issue, as determined by the rating committee. While ratings upgrades and downgrades occur across the entire credit range, historically they have occurred more often in lower-

rated categories, depicting increased volatility. On average, higher ratings generally have been more stable than lower ratings.

If ratings are lowered, it is the agency's opinion that there is a greater likelihood of default. Equally, if upgrades take place, the agency believes there is less likelihood of default. A rating change signifies the agency's opinion of creditworthiness and is only one factor among others that investors should consider when making an investment decision.

In some cases, changes in the business climate can affect the credit risk of a wide range of issuers and securities. For instance, new competition or technology, more than what might have been expected and taken into account by the ratings, may worsen a company's expected earnings performance, which could lead to one or more rating downgrades over time. Growing or decreasing debt burdens, robust capital spending requirements, and regulatory changes may also trigger ratings changes. In addition, the agency may adjust its ratings in response to mergers and acquisitions, or an increase or decrease in projected revenues.

While some risk factors tend to affect all issuers, others may relate only to a narrow group of issuers and issues. S&P's provides the following examples:

- A securitized obligation based on underlying credit card payments may have geographically concentrated portfolios, exposing it to regional slumps that a more diversified pool would dilute.
- The creditworthiness of a government issuer may be affected by changes in the stability of political and economic institutions within its country.
- In the case of corporate issuers that adopt a highly aggressive business model, such as growth through large acquisitions or expansion in unproven markets, the risks associated with their ability to execute this strategy are important factors in assessing their creditworthiness.

Volatility of ratings can be expressed either as the percentage of ratings that change or the frequency of change. Higher ratings, in general, have been more stable than lower ratings. However, these proportions can increase during periods of significant and unexpected changes in the credit markets or the business environment. In addition, credit ratings for a specific industry, or for a type of structured finance instrument, can have higher or lower rates of change than the general averages.

The agency may withdraw a credit rating at any time. For example, it may withdraw issuer credit ratings when there is not enough information to actively monitor the rating. It also withdraws the ratings on issues that have been fully repaid. In rare cases, credit ratings may also be withdrawn at the request of an issuer, for instance because of mergers and acquisitions. In some of these cases, the agency may temporarily suspend rather than withdraw a credit rating, if it believes that adequate information will become available. Before proceeding with the withdrawal or suspension of the rating, the agency will affirm, downgrade, or upgrade the rating.

Historically, structured finance ratings have been relatively stable in comparison to corporate ratings. Yet structured ratings are also subject to circumstances that can result in greater ratings volatility than is typically the norm. This volatility may affect the markets generally, or only certain asset classes.

2.6. CREDIT RATINGS CRITERIA

The most important variable measured in credit risk models is the Probability of Default (PD), but another variable which is also measured, is the exposure which is determined by the expected timing of default and by the Recovery Rate (RE) after default has occurred: According to Marwan Elkhoury (2008) the differences on the key components as measured by the three dominant credit rating agencies are the following:

• Standard and Poor's ratings seek to capture and measure only the forward-looking probability of the occurrence of default. They do not evaluate the expected time of default or mode of default resolution and recovery values

• By contrast, Elkhoury states that Moody's ratings focus on the Expected Loss (EL) which is a function of both Probability of Default (PD) and the expected Recovery Rate (RE). Thus $EL = PD(1-RE)$ and

• Fitch's ratings also try to model both PD and RE. Elkhoury finds that they have a more explicitly hybrid character in that analysts are also reminded to be forward-looking and to be alert to possible discontinuities between past track records and future trends.

As previously described the procedures of rating assignment include rating committees, which could be a source of subjective judgment rather than objective assignments. Credit rating agencies provide little insight as far as the way which they assign relative weights to each factor concern, though they do provide information on what variables they consider in determining ratings, for sovereigns or firms.

Furthermore, it is not easy to recognize the relationship between the criteria they set and the actual ratings, in part because some of the criteria used are neither quantitative nor quantifiable but qualitative. The variables can present interrelation and the weights are not fixed or recorded either across sovereigns or over time. Even for quantifiable factors, determining relative weights is difficult because the agencies rely on a large number of criteria and there are no clear and same patterns followed for combining the scores to determine ratings .

2.7. ASSESSING THEIR PERFORMANCE: THE ASIAN CRISIS

In the factory of emerging markets, especially during the Asian crisis, there have been recorded several forms of nonstandard responses to external pressure and speculation.

Even though it is sometimes difficult to set a border between a standard response and an intervention in the financial markets, Hong Kong's SAR's interventions in the equity market by buying a total of some $ 15 billion in stocks and futures is considered to be an apparent example. The method was used to stop speculators from attacking on both equity and currency markets, but it eventually did not lead to protection, since Hong Kong's fundamental macroeconomic data were weak and as a result, no matter what, deep recession came along. On the other hand, Brazil chose to intervene in the overseas bonds markets by buying large quantities of its bonds, in order to prevent short selling and other forms of speculation Malaysia imposed a range of capital and exchange controls on outflows in order to avoid the destabilization of its economy coming from the developments of the overseas markets. The common denominator of these three countries is that these interventions had a very short-term effect and did not prevent the inevitable results, which would later be called as the recent emerging markets financial crisis.

In the light of these events, it needs to be examined why credit rating agencies did not warn of the crisis neither were their economic fundamentals reflected in an accurate way.

One of the prevailing problems of the financial markets is asymmetric information between savers and investors, as already described in the previous section. That means that savers are highly likely to have much less information about the projects they want to invest in than the owners or the managers of the projects. The sources that fill this gap are mainly the following: commercial banks which collect private information, public information coming from market institutions and a result of regulatory disclosure requirements and finally investment newsletters and credit rating agencies. Therefore, credit ratings agencies evolved rapidly because they cope with asymmetric information without government interference in an efficient way. Credit ratings have been initially used in prudential supervisory regulations, but they have been also used by self regulatory bodies and they have been mainly used to prohibit certain institutions from holding low-rated securities, to modify disclosure requirements and to adjust capital requirements (BASEL II)[5].

The most common rating procedures, as already described, followed by S & P's and Moody's, include firstly meetings between the agency's staff and the management of the company or government officials in order to gather information, so as to make an evaluation.

The analysts then prepare a presentation for the rating committee, which after debate determines the rating to be assigned. There is a brief period, (typically a week) during which the issuer could influence the rating by discussing matters that are not taken into consideration and then the rating goes public. After the initial rating the agencies monitor the economic and financial condition of the issuer and if its conditions are significantly or suddenly changed they adjust their ratings.

It can safely be stated that when issuing a sovereign's rating the agency takes into consideration a variety of political and economic factors, which is a more complex procedure than that for corporate ratings. Several economic factors are considered to be influencing the creditworthiness of a sovereign such as the monetary and fiscal policy, inflationary pressures, public and private sector debt burdens and debt-service track record. The government stability and unity and other political factors affect the ratings as well and are subject to wide margins of error. However, there is no standard model to assign sovereign ratings. It is noticeable, however, that agencies generally do not conduct extensive scenario analyses and stress testing and they only rarely assign probability to

specific risk factors and scenarios when assigning and monitoring ratings. The fact, on the other hand remains that numerous surveys depict how these imperfect evaluations influence financial markets.

A clear example of the weaknesses of the rating methods the agencies use has been the Asian crisis that took place during 1997 and 1998. At that period the largest and most abrupt downgrades in the modern history of sovereign credit ratings took place (this negative record of abrupt downgradings was broken, however, by Greece and Ireland during the debt crisis of the European South which still continues to develop). Critics have argued before the crisis that the agencies did not warn soon enough and overreacted once the crisis emerged. To their defense, the agencies argued that the downgradings where a result of the revelation of new information that had a significant impact on the short-term liquidity position of the sovereigns, referring to Thailand and the size of the central bank's forward exchange position.

All the three biggest credit rating agencies (S& P, Moody's and Fitch IBCA) expressed ,however, their willingness to renew their methods by broadening the factors they analyze in order to assign ratings for sovereigns. In this view factors such as financial systems weaknesses and especially in the banking system, or contagion or reliance on short-term external debt and other capital flows by either the private or the public sector receive greater emphasis.

However, the fact remains that the difficulties in assessing investment risks adequately, accompanied by the key-market failure, which is the free-rider problem usually result in underinvestment in analysis and therefore still question the validity of the credit ratings.

2.8. SOVEREING CREDIT RATINGS AND THEIR PREDICTIVE ABILITY

Sovereign credit ratings are ratings that are assigned to obligations of national governments. They are essential and have become a prerequisite when a country decides to enter international capital markets and a good or worse credit rating affects the terms of this access. Credit ratings are proved to influence yield spreads of sovereign bonds.

Difficulties of rating agencies in assigning sovereign ratings in particular can be spotted when evaluating not quantifiable elements and when setting weights for the factors they choose to take into consideration during the evaluation process.

The most commonly used and measured variables in order to assign a sovereign rating are: per capital income, GDP growth, inflation, fiscal balance, external balance, external debt, economic development and default history. Five of the eight criteria are directly affecting the ratings. Higher per capital income, lower inflation and external debt and high level of economic development all lead to higher ratings while any history of default leads to lower ratings. However, surprising seems to be the fact that GDP growth and fiscal and external balance do not present a simple and clear relation with the ratings. Fiscal and external balance is not clearly related to ratings because they may reflect endogenously in both the fiscal policy and international capital flows. While GDP growth is not considered as reliable for emerging markets for example, because, it tends to grow faster than the matured economies. It should be noted however, that apart from quantitative indicators the agencies also take into consideration other qualitative, social and political elements of the national governments.

There are numerous studies, which try to prove that the predicting ability of the credit rating industry is poor using several methods and variables, some of which are presented below.

The model, which is used to support these findings by R. Cantor and F.Packer, explains at extremely significant level (90%) large rating differences. As far as small rating differences are concerned (meaning smaller than three notches), the model sheds almost no light at all.

It further proves that ratings explain at a very large extend sovereign fields. It shows that sovereign bonds rated below A receive higher spreads than US corporate securities. Furthermore the regression proves that ratings appear to provide additional information beyond the standard macroeconomic factors, because they alone explain 92% of the variation. It could be safely concluded from the previous outcome that ratings effectively summarize the information contained in macroeconomic factors.

The same model measures the impact of rating announcements on markets through an event study on the dollar bond spreads. As it could also be concluded from the present state in the euro bond

markets, according to the study, agency announcements of a change in sovereign risk assessments appear to be preceded by a similar change in the market's assessment (through yield spreads) of sovereign risk. Statistical findings confirm the high signify cause of rating announcements. To be more specific, almost 63% of the samples of rating announcements are associated with changes in spread in the expected direction, no matter if the rating announcement is positive or negative. A finding that was not expected is that rating announcement have a highly significant impact on speculative-grade sovereigns but a statistically insignificant effect on investment-grade sovereigns. Another conclusion which was made after a multiple regression, is that the immediate impact of an announcement on the yield spreads is greater if the announcement is made by Moody's or if it is related to speculative-grade credit.

Finally, the results suggest that the impact of one agency's announcement is greater if the announcement confirms the other agency's rating or a previous rating announcement and that comes along with the result that rating announcements that are more fully anticipated have , if anything, a larger impact than those less anticipated.

Unlike developed markets crises, in emerging financial markets there is a strong connection between currency crises and default. Carmen Reinhart investigates the behaviour of credit ratings concerning their ability to be forward-looking and especially their ability to predict currency crises which in the case of emerging markets are linked to defaults. Thus, credit ratings should be able to predict crises and downgrades should precede these crises. However, according to anecdotal evidence this was not the fact in the Asian crisis, since downgrades followed the currency crisis. To support this anecdotal evidence Carmen Reinhart uses data from three main sources, the Institutional Investor, Moody's Investors Service and Standard and Poor's. The sample of Institutional Investors comprises of 62 economies and is the biggest sample. The economies are rated from 0 (least creditworthy) to 100 (most creditworthy) and ratings are reported twice a year and changed frequently. Moody's and S and P's use multiple letters to assign sovereign ratings and they change their ratings at any time and so in the samples are included ratings for each economy, the months in which changes took place.

To evaluate the existence of the relationship among currency crises, default and sovereign ratings, there is first of all need to define and date the crises. Two different definitions of crises are used for that purpose, the first one is the one that is used by Kaminsky and Reinhart and the second one is

employed by Frankel and Rose. Kaminsky and Reinhart use a weighted average of the rate of change of the exchange rate $\Delta e/e$, and the rate of change of reserves $\Delta r/r$, according to the following relationship:

$$I = (\Delta e / e) - (\sigma_e / \sigma_R) * (\Delta R / R) \qquad (1)$$

Where σ_e and σ_r are the standard deviations of the rate of change of the exchange rate and the change of the reserves equally.So, according to this index any measurement which is three standard deviations or more above the mean is characterised as crisis.Frankel and Rose's definition of a currency crisis is a 25% or greater devaluation in a given month that is also at least 10% greater than the devaluation in the preceding month. The dates of default are extracted from the investigations of Beers and Bhatia (1999), Beim and Calomiris, the World Bank's Global Development Finance and Detragiache and Spilimbergo.

Then, in order to compare the performance of ratings with the performance of some other predictors of financial crises Kaminsky and Reinhart developed the "signals" approach. They made a matrix separated into four categories: probability of a crisis within 24 months conditional on a signal, probability of a crisis within 24 months not followed by a signal, probability of no crisis in the next 24 months conditional on a signal and probability of no crisis accompanied by no signal. For credit ratings, a downgrade in the next 24 months before a crisis would be considered a signal. Accordingly, in order to investigate the interaction between defaults and currency crises two matrixes have been created based on the same model.

The results from these matrixes are revealing. Without including developed economies the unconditional probability of defaulting reaches 13.3 %, while the unconditional probability of a currency crisis is about 17%. The results change little when developed countries are added depicting in that way that the most popular problem that emerging economies face (unlike the developed ones) is the debt problem. The probability of a currency crisis within 24 months of defaulting reaches 84%. The opposite phenomenon however is rarer (defaulting within 24 months of a currency crisis) and the probability reaches 58% for the whole sample and 66% for the emerging markets. These results can quite safely lead to the conclusion that currency crises are more frequent and do not necessarily lead to default.

Furthermore, examining the credit ratings and their behaviour during crises Carmen Reinhart finds evidence that most of the times devaluations follow (especially for the emerging markets) rather than not. The analysis of data from Institutional Investor suggests that in the event of currency crisis and during the following 12 months the index for emerging economies (sovereign rating index) dropped to 10.8 % on average, a downgrade which is five times greater than that for developed countries. It should be also noted that the gap between emerging and developed economies in the first place was significant (average rating 37.6 which is slightly less than half the average rating for developed countries), which also stresses the fact that even without crises, emerging markets face problems with their access in international financial markets. The results from Moody's show to the same direction. However, the probability of downgrades is far greater during the 12 months after crisis in the case of Moody's. So, all sources (including the sample from S and P's) suggest that a currency crisis increases the probability of default, but they do not necessarily equal to default. The regressions from both samples indicate that currency crises for emerging financial markets help predict downgrades no matter what sample is used. However, for developed economies the results are not conclusive. For emerging financial markets the evidence suggest that downgrades or devaluations increase the probability of default, but currency crisis still cannot predict defaults. The results also confirm the interaction between ratings and market conditions (yield spreads of sovereign bonds).

In order to assess the ability of credit ratings to predict currency crises and defaults Carmen Reinhart uses a probit estimation. The results from the estimation of the data from Institutional Investors have the expected sign (negative) for the currency crises as far as the coefficients are concerned. But for the two definitions of currency crises the coefficient is significant at 10% level. The coefficients of the Institutional Investor ratings are also important at 10% confidence level.

Unlike the results which stem from the estimation of the data from Institutional Investors, the results for Moody's and Standard and Poor's show that the coefficients on the ratings variable are statistically insignificant and the coefficients often have the wring sign for the dates of crises, even though they do better for the dates of default. A comparison between the performance of credit ratings as predictors of financial crises (banking crises and currency crises) and some of the economic indicators which are also used and viewed as predictors of financial crises reveal an underscoring picture of the previous results. The following indicators, which are the noise- to signal ratio, the percentage of crises accurately called and the marginal predictive power, are used to assess

the performance of the two groups. From this comparison it is shown that the Institutional Investor credit ratings perform worse that the better indicators in predicting currency and banking crises and their marginal predictive power is small in comparison to the top indicators. There are various reasons for the disability of sovereign credit ratings in predicting financial distress in a better way. First of all financial crises are generally difficult to predict. Furthermore, the majority of defaults is linked to currency crises whereas the converse is not true. From these results, it can be concluded that credit rating appear to have paid attention to a set of fundamentals that do not present reliability in predicting currency crises. According to Reinhart, credit agencies have overestimated to weight of debt-to-export ratio which tends to be a poor indicator of financial stress and have set little weight to indicators of liquidity, currency misalignment and asset price behaviour, which are more reliable leading indicators of the kind of financial stress that can lead to both currency crises and default.

The interaction and the causality amongst the credit agencies' ratings and the economies' evolution are being discussed by Mora (2006), Elkhoury (2008), Kräussl (2003) and Amadu (2009).

Nada Mora (2006) examines whether credit rating agencies have encumbered the East Asian crisis through their excessive downgrading of these countries. The study develops an extension of the Ferri et al. (1999) linear model in combination with an ordered probit model. The most important catalyst of the study, according to the author, was the examination of the after-crisis period 199-2001. The data of analysis was consisted of long-term foreign-currency denominated debt for all the rated countries, macroeconomic data and indicators on development and default history for the period 1985 to 2001. Based on the study's findings, credit ratings are rather sticky than procyclical. Furthermore, the extension of the analysis to the after-crisis period (1999-2001) provides evidence that the ratings are characterized by inertia. Therefore, the author suggests that a more cautious stand should be taken on accusing the sovereign credit rating agencies. In addition, the author argues that credit ratings capture the crisis but they remain over-conservative after the crisis and they only adjust when there is a sufficient large divergence of predicted ratings from assigned. Moreover, when the ratings do not react to market sentiment the shortage of credit may be attributed to excessive downgrading but the shortage would have occurred regarding of the ratings. In addition, this study provides evidence that the ratings react to non-macroeconomic factors such as lagged spreads and a country's s default history.

Amadu (2009) deals with the impact of the credit rating agencies' ratings on the markets and their accountability for the various financial crises (Asian Crisis, Enron, WorldCom, Parmalat) that have afflicted the economy lately. He makes a rigorous retrospect to the recent history in order to denote how the CRA's downgrades have created a vicious circle leading to major losses and liquidity shortages and how the absence of systemic regulation has played a role on that. By making an extended reference on the affect of ratings on various market products, he highlights the need for stricter monitoring of the CRA's and proposes as a counteractive to that the construction of "Rating-Maps" and the conduct of stress tests to Balance and Off Balance Sheet data. The policymakers could thus come up with the underlying risk of credit ratings and how this is transmitted to the various groups of interests and respectively quantify it.

Elkhoury (2008) deals with the overweight significance that has been placed on the ratings of the credit rating agencies by the financial markets globally and by the Basel Accord (Basel II), the censure they have been facing due to the misfits that arise from various issues and the attempt to regulate their operation to a certain extent. Certain concerns such as the profession's introversion and the absence of competition, the transparency of the criteria used and their responsibility towards the parties using their ratings, are the major issues of criticism. The writer argues about the vitality of credit agencies' role in generating outcomes about the solvency of both countries (sovereign risk) and companies, but objects to their lag or reactions and recalculations, which has been attested through the recent history of crises. Although certain proposals have been made by various corporations towards the formation of a certain "Code of Conduct", it seems, however, to be too early to draw conclusions from its application so far.

Kraussl's study examines the way the ratings of the credit rating agencies affect the emerging market economies both on downgrades and upgrades. Unlike others, Kraussl (2003) recruits both panel regressions and event studies using not only implemented credit risk changes, but also pending rating actions. He tests a total of 302 sovereign credit ratings given by the two major credit rating agencies (S & P and Moody's) during the period of 1997 to 2000, capturing thus the Asian crisis, as well as the financial turmoil in Russia and Brasil. For the panel regressions, he constructs an index of speculative market pressure, using the weighted averages of the nominal changes of exchange rates, the daily short-term interest rate changes and the daily stock market changes, omitting however the government bond yield spreads. For the event studies, he makes use of events unbiased by each other

in order to test the possible upshots of the credit rating agencies' actions in the markets and examines therefore the effects 10 days before and after the action. The conclusion drawn from his study highlights the fact that the emerging countries' financial markets react strongly to the credit rating agencies' rating changes and especially to the negative ones, such as government downgrades and, in general, negative pending actions, rather than to positive actions. In comparison to the market participants' anticipations about risk changes, the latter has a smaller impact on the emerging economies' markets.

CHAPTER THREE

CREDIT RATINGS, PROYCLICALITY AND RATING THROUGH THE CYCLE METHODS

3.1. INTRODUCTION

The literature presented in this chapter, focuses on the examination of the relationships between credit cycles and macro fundamentals, the feasibility of the Through-The-Cycle (TTC) rating methods as a proposed solution to procyclicality as well as the existence of cyclical effects in credit rating and default risks. Moreover, the interaction and the causality between the credit rating agencies' ratings and the economy's evolution is also examined.

3.2. CREDIT RATINGS AND PROCYCLICALITY

Credit ratings agencies, as stated before, have been arguing diachronically that credit ratings see through business cycles, meaning that credit ratings are supposed to be independent of the state of the business cycle and it is commonly stated by the credit rating industries that credit ratings are forward looking and therefore capture the business cycles. The procedure that is followed by J.D. Amato and C.H. Furfine, however, gives evidence that credit ratings that are newly issued are related to the macroeconomy in a procyclical way, meaning they are conditionally better during upturns and conditionally worse during downturns.

The financial system is procyclical, meaning and there is literature (Bernanke et all (1999)) that explains it with an accelerator model. Furthermore, even though it is not universally accepted, it is

believed that financial market participants tend to behave as if risk is countercyclical, leading to the financial system's procyclicality. But, unlike credit risk models, bank lending standards and bank supervisors, credit ratings are not supposed to move in a procyclical way and it is in fact stressed by the agencies that ratings should not be considered as absolute measures of default risk, but as a relative measure of bonds or firms risk and specifically as ordinal rankings of default risk. But studies that have been conducted from time to time have brought evidence that ratings may be relates to business cycles. Nickell et al (2000) find relation of rating transitions to the state of business cycle, without specifying, however, if credit ratings are assigned in a procyclical way. Altman and Kao (1992) findings suggest that either the quality of firms has declined over time or rating standards have become more stringent, because in their sample the number of the firms that was downgraded was far bigger over time than that of the firms that were upgraded. Blume, Lim and Mackinlay (BLM) (1998) agree that credit ratings have worsened through time, due to the fact that the agencies have become more stringent.

Amato and Furfine use the following method in order to examine whether credit ratings are procyclical or not. In order to measure business risk they take into account the firm size, which they expect to be negative, as larger firms tend to have better ratings, and from the market model they define the other two measures of business risk, which are systematic equity risk or beta and idiosyncratic equity risk or non beta. In order to assess financial risk they choose four ratios, that capture it in a satisfying way. Interest coverage, which is appropriately categorized in order to give accurate results, the operating income/sales ratio, long-term debt/assets and total debt/assets ratio are all measured in a three years row order to cover a full business cycle.

In order to set the factors that influence ratings depending on the face of the business cycle, Amato and Furfine utilize two types of business cycle indicators. They set the first to be an indicator of recessions and expansions and the second to be a continuous indicator of the state of the economy. They adopt the NBER recession indicator, but they also use another set of indicators so as to capture the potential impact of the business cycle. More specifically, they use the output growth gap, defined as the difference between the real GDP growth and potential GDP growth, and the histogram of annual real GDP growth rates for the entire sample period, which is considered to be a discrete-valued indicator of the relative rate of current real GDP growth.

They then create two data sets. Data set 1 contains annual observations of all the firms (investment grade US firms and speculative grade US firms) according to the observed frequency of balance sheets. From this sampling 10.144 observations occurred. Data set 2, however, contains only initial ratings and rating changes, so as to overcome the problem of staleness in ratings, which means that the connection between the rating and the factors that influence its determination might not truly depict decision making procedure of the rating agency. In this data set there were created 2.353 observations.

The results from the two data sets are quite different. The results which have occurred from data set 1 drive to mixed conclusions. In some cases procyclicality is detected, but overall it is not strong enough so as to be firmly stated. However, as far as the second data set is concerned, the findings are clearer. A change in the state of the business cycle, ceteris paribus, changes many ratings by one category at most. The percentage of rating changes equals to almost 26% and it should be added that changes in ratings are more intense in frequency for the higher and the lower categories. These results are both statistically and economically significant.

To sum up, the evidence from the two data sets imply that credit ratings actually act in a procyclical way and they exhibit excess sensitivity to business cycle conditions. This could be a result of excessive optimism during booms and stronger than necessary pessimism during recessions by the agencies. However, it could be also a result of qualitative evaluation of firms, which cannot be captured by the fundamentals and can be influenced be the perception of the investors about the creditworthiness of the firms

3.3.   CREDIT CYCLES AND MACRO FUNDAMENTALS

With respect to the relationship between credit cycles and macro fundamentals, Koopman et al. (2006) examine their relationship by applying intensity based models.

They examine the relation between the credit cycle and macroeconomic fundamentals in an intensity based framework. According to the authors and based on the diversification property, diversification can only reduce the idiosyncratic risk component in a portfolio while the systematic credit risk

component remains. Thus, a proper modeling should be made of the correct dynamics of systematic credit risks components.

The analysis applied to this paper is based on Koopman et al (2005) methodology where the credit cycle is estimated directly from rating and default data at the micro level using intensity models with latent common risk factors. In more detail, the analysis models intensities of rating and default transitions on both observed macro fundamentals and on an unobserved credit cycle component.

The data used in the current analysis are derived from the data set of Standard and Poor's over the period of December 1980 to June 2005. All the U.S. firms are collected and a broad rating category classification of investment grade (BBB- and above) and sub-investment grade (BB+ and below) is used. All the transactions such as rating transitions or defaults, firm becoming non-rated, firm entering the sample are taken into account while all the types of each event result in a change in the intensity of the pooled process.

Regarding the variables, nine macroeconomic variables are drawn from the data base of the Federal Reserve Bank of St. Louis (FRED). The dataset of the explanatory variables includes both current information and forward looking indicators such as interest rate-based measures and stock market variables. More specific, three sets of variables are chosen which are business cycle, bank lending conditions, and financial market variables. The business cycle block contains the Gross Domestic Product (GDP). Industrial production, manufacturer's orders, and capacity utilization, are not included as explanatory variables since they are already captured in GDP developments. With respect to the general economic variables indicators, four different bank lending conditions variables are included in the analysis: commercial and industrial loans outstanding, money supply / M2 growth rate, discount rate, and the quality spread. As financial market variables, the returns on the S&P500, the volatility of the S&P500 returns and the interest rate spread are included in the analysis.

The modeling framework is built on a standard (marked) point process methodology. Counting processes have been calculated where each counting process indicates the type of transition that is counted. For modeling purposes it is assumed that count processes are modeled through their intensities. The intensities are modeled through the latent factor intensity model of Koopman et al. (2005). The current analysis concentrates on the systematic factors that drive migration and default

risk and summarize all the firm-specific information in the ratings. Unit root tests are imposed to check for stationarity of the series while standard likelihood ratio tests are also applied.

The estimation is based on the importance sampling techniques set out in Durbin and Koopman (2001, Part II). In the study, they are applied Monte Carlo methods for the evaluation of the maxim likelihood function set in the analysis.

The model of analysis is initially implemented without any macro fundamentals in order to obtain a preliminary estimate of the credit cycle present in the data set whereas five different models are estimated. At a second stage the macro fundamentals are inserted in the model first GDP and then the remaining factors where a multivariate regression is conducted. In order to test the robustness of the analysis' results a number of sensitivity checks are performed.

According to the findings of the study, the results are in line with the previous studies in terms that the level of economic activity, bank lending conditions, and financial markets variables are all important determinants of default and rating migration intensities. Nevertheless, the models were proved to be significantly dynamically misspecified due to the strong remaining autocorrelation in the intensities. If this misspecification is accounted, many of the macro fundamentals fall out of the model. The major remaining components were proved to be the GDP growth, and to some extent financial markets' variables like stock returns and stock return volatilities. It should be noted that the results appear robust over a variety of model specifications as for instance over the Greenspan era (post 1987) and by using various choices of leads and lags of the macro variables included.

Based on the analysis and throughout all specifications, defaults (and downgrades) were proved to be much more subject to common risk factors than upgrades. Furthermore, based on the results significant departures were spotted between the systematic risk components in defaults, downgrades, and upgrades themselves. The results indicate to an overly optimistic re-rating policy in the late nineties, followed by a possibly overly pessimistic lack of upward rating revisions in the early 2000s.

Based on the current research conducted, a number of interesting alternative research questions can be raised. The respective queries are subjective to the issue that if the current broad set of macro variables used in this analysis is only assisting into a limited extent in explaining default and re-

rating intensities, other variables that capture intensity dynamics should be taken into account. A potential suggestion according to the author could be the inclusion of variables which could capture industry and contagion effects. Alternatively, the model could be enlarged by the inclusion of firm-specific variables. Nevertheless the firm-specific variables would only assist, if they are correlated, with any missing systematic effect in the credit risk dynamics. Last but not least, it is recommended by the author that the class of dynamic models can be enlarged for the latent common risk component from the current random walk to a more richly specified autoregressive structure.

Allen et al. review the academic and proprietary models in order to analyze how macroeconomic and systematic risk effects are incorporated into measures of credit risk exposure. The probability of Default (PD), loss given default (LGD) and exposure of Default (EAD) metrics are taken into account.

Based on the findings of the literature's consensus, a positive correlation has been detected among PD and asset values. Moreover, PD can be impacted by firm interdependence, cyclical effects in asset valuations and shifts in the regime. In addition the survey provides evidence that default correlations are higher for low credit quality firms than for highly rated firms. Based on subjective studies, systematic factors affect LGD as well as PD. Especially, regarding LGD positive correlation has been spotted (based on the consensus) with asset and collateral values. Furthermore, based on the survey, recovery rates are time-varying and correlated with external credit ratings and short term risk-free rates. Even though the correlation between PD, LGD and EAD has not been sufficiently covered in the literature, evidence have been provided indicating correlation between PD and LGD in a way that both metrics are correlated to the same systematic risk factors. With respect to EAD, anecdotal evidence of procyclicality has been traced in EAD particularly in terms of loan commitments. Based on the review of the respective literature, despite the fact that systematic risk factors have been taken into account to both academic and proprietary models of PD, the same has not been applied on LGD and EAD.

In addition to the above findings, Lowe (2002) discusses the two-fold association between macroeconomy and credit risk measurement. Whether credit risk expands or contracts during economic blooms and whether banks should accordingly increase or decrease their capital during growth periods constitutes the handle for raising three very important issues. As to what is the

interrelation between credit risk and macroeconomy, the writer suggests that no strong conclusions can be drawn from the evidence. It is however, reasonable to support that for periods of vast expansion, not firmly based on fundamentals, it is more possible that periods of gleam growth will follow and that is where the issue of credit risk measurement rises aggressively. This cannot, nevertheless, constitute a rule of thumb. In his attempt to examine how macroeconomic factors are taken into account in the various risk metric models, the writer discusses all four "pillars" that all credit risk measurement models are based on. He concludes that much progress has been made in assessing credit risk but, still, minor significance has been given to incorporating a macroeconomic view in the models, despite the evidence given from the recent history. Building up certain cushions during economic bloom seems to be the case since it is more possible for the banks to raise the level of capital in periods of economic upturn and decrease it in downturns. The writer concludes that the markets' and supervisors' vigilance in association with a careful perspective of all macroeconomic factors should play an important role in the banks' decision making as to their capital adequacy irrespective of the models' outcome.

3.4. RATING THROUGH THE CYCLE

Kauko examines the Through-The-Cycle (TTC) rating methods and their feasibility as a proposed solution to the procyclicality problem. In more detail, it tests the existence of the cyclical component of credit risk.

Based on the past literature, the changes in the credit risk are assumed to consist of the permanent structural changes and the transitory cycles. TTC ratings are based on the structural component and disregard the cyclical component. In case the mean-reverting cyclical component exists, and if it can be measured with acceptable accuracy almost on real time, TTC ratings can be calculated by eliminating the cyclical component from the perceived point-in time credit risk.

His analysis applies a Merton (1974) type credit risk measure. The raw data for the analysis has been drawn from Moody's KMV. The data is based on option pricing theory and the Merton (1974) model for corporate credit risk. The inputs consist of market capitalization of corporate equity, its historical volatility and corporate debt on the balance sheet.

These variables have been used in order to calculate the distance-to-default (DD) where DD is a point-in-time (PIT) measure of credit risk. Based on the author's findings, which are also backed-up by the respective literature, the Merton model alone is not a perfect measure of credit risk, but its predictive power is clear. The analysis is carried out with monthly data on annual default probabilities of non-financial companies quoted on the Helsinki Stock Exchange.

The sample was consisted of 119 firms with at least five years of data between August 1999 and December 2009. Based on the author's view the sample is still relatively short for analysis on cyclical phenomena, but it describes a highly cyclical economy.

The analysis is based on the analogue of Löffler (2004). In addition, the modified Akaike criterion is used in the respective analysis in order to account for stationarity, as it takes into account the consequences of the potentially biased sum of autoregressive coefficients. In addition panel data regression analysis has been used for the current study.

Based on the general suggestion, the procyclicality issue of Basel II could be resolved by the utilization of the through-the-cycle (TTC) ratings in banks' IRBA models. The feasibility of TTC ratings is based on the time series properties of credit risk at the debtor level. This study indicates some empirical evidence on this issue. Based on the findings, the DD seems to follow a unit root process in most companies and few if any cases have got an equilibrium value of credit risk that would remain constant for lengthy periods of time. Especially in the case of small-cap firms, some tendency to reversion to previous levels of credit risk can be observed. Nevertheless, this serial correlation among small-cap firms is of little use in eliminating the cyclical component of credit risk in banks' capital adequacy calculations because these transitory fluctuations seem idiosyncratic rather than cyclical. Little evidence on the existence of regular transitory cyclical fluctuations of credit risk was spotted on the company level. The cyclicality of a typical company seems highly unstable and varies from cycle to cycle. Thus, TTC rating philosophies based on the idea that transitory cycles must be filtered out do not seem fully feasible.

According to this study it has been concluded that the cyclicality of the creditworthiness of a typical company undergoes frequent and fundamental changes. Firms that were strongly impacted by the

previous phase of business cycles can suddenly remain almost unaffected by the macroeconomic environment, and vice versa. These findings do not imply that it is impossible to distinguish cyclical companies from non-cyclical ones but instead it was simply proven that historic correlations are not significant in assessing this vulnerability.

The current research has not found any evidence to support the hypothesis of the multiple credit risk drivers but it should be noted that this analysis is not exhaustive. The author suggests that by applying sophisticated factor analysis techniques and different rotations to the same data set might be an interesting way to expand the analysis and a satisfactory explanation to the irregular changes of companies' cyclicalities might be found. However, it is noted that the Basel II framework is based on the Asymptotic Single Risk Factor approach, and it may not be obvious how to take into account different factor loadings in order to calculate TTC ratings in Basel II compliant IRBA models.

According the current study's outcome, even though companies' credit risks seem to follow unit root processes, the simulations in this study demonstrate that the average credit risk of a representative loan portfolio may be stationary and therefore subject to transitory fluctuations. This inconsistency can be explained by the entry and exit of debtors. Therefore, it would be feasible to make a cyclical adjustment to the portfolio after calculating the credit risk at the debtor level, at least if the portfolio is subject to a same kind of entry and exit of firms. On the contrary, it is not obvious why it would be useful to calculate the credit risk of each debtor by using highly sophisticated methods, and then to apply a coefficient that prevents the variation of the capital requirement. The author suggests that by choosing a suitable constant risk weight for the whole portfolio would yield the same capital requirement with much less work. In addition, it is suggested that a more sophisticated way to implement TTC ratings would be by applying smoothing at the rating category level.

Since there is plenty of academic and anecdotal evidence that credit rating agencies perform rather inefficiently, as far as ratings' assignments are concerned, because they do not seem to reflect all the available information, Gunter Loffler tries to examine what do the agencies' methods involve and if these empirical evidence of agency ratings reflect informational inefficiencies or are actually inherent to the agencies' rating system.

He uses the credit risk model introduced by Robert Merton and its key variable, the distance to default. According to Merton (1973), distance to default is the standardized difference between the assets' value and the default threshold, which is related to each company's liabilities. In addition, he categorizes ratings as through the cycle (TTC) ratings and point in time (PIT) or current condition ratings. Their differentiation is relevant when default risk presents cyclicality. Thus, Loffler sets a case in which asset values are subject to both permanent and transitory shocks. PIT ratings react to both shocks, while TTC ratings react only to permanent ones. Furthermore, TTC ratings are assumed to be based on distance to default, if a stress scenario takes place, which has as a reference the permanent credit quality of a borrower. Thus, using Kalman's filter, which is the optimal way according to Loffler, it is feasible to separate ratings into permanent and cyclical components.

Given the above setting, TTC ratings are relatively stable and have a low prediction ability as far as default is concerned. The stability of the credit agencies' ratings is also exhibited by Carey and Hrycay, who found that agency ratings exhibit less cyclical variation and are more stable than PIT ratings, something that is also quoted by the rating agencies themselves and is evidenced to be consistent with the methology they follow. Loffler argues that because TTC ratings are not based on the current default probability and because the asset value process will not be identical for all the borrowers, TTC ratings will actually have a low default prediction power, in contrast to the PIT ratings, which are proved to have better predictive power. According to the results of Loffler's tests, even if credit rating agencies are provided with all the available information and use them in an efficient way, which means that they are incorporated into ratings on time, ratings will not predict defaults in the most optimal way. Thus, this result could be a consequence of agencies' rating methology. It could be, however, attributed to the fact that agencies consistently underreact to new information.

Another feature of ratings which is tested is that they are not perfectly correlated with actual default risk. Even though it has been documented that rating changes depict significant positive autocorrelation, it is not proved in light of the framework set by Loffler. However, it is estimated that changes could be explained by past rating changes provided new information is controlled for. The serial rating changes could all refer to a unique shock and therefore the reason for a consecutive downgrade for example could be the same again and again.

Lastly, some rating changes can be also unrelated to new information, if this information does not affect current condition probability of default in a significant way, but has a rather important impact on the permanent components, thus making credit ratings react strongly. Whereas predictability in the usual sense could come as a result of errors in the degree of procyclicality. Therefore, empirical evidence on ratings should always be evaluated and interpreted with care.

CHAPTER FOUR

EMPIRICAL MODEL

4.1. DATA

The analysis which is developed in this thesis is based on three variables: S& P's ratings, 1 year default likelihood and Bloomberg ratings, all of which were selected from the Bloomberg database. It should be mentioned that the Bloomberg database currently consists of 2.300 non financial firms in USA and 765 firms in Canada, meaning that the database includes all sectors except for financial, insurance and real estate sectors. Our sample consists of 32 companies, randomly selected, two for each S& P's rating category and the timeframe was set from 01/01/1999 to 31/12/2010, with the observations depicted on a monthly basis. It should be mentioned that the rating categories that we examine include all grades, until B- in S&P's classification, since the C categories include firms in the last stage before classified as defaulted.

4.2. 1ST VARIABLE: S& P's RATINGS

It has been previously discussed how credit rating agencies assign credit ratings to issuers, countries or firms. Only S& P's ratings are chosen in this particular study for simplification, but Moody's ratings could be used as an alternative or in comparison to S&P's ratings as well. These ratings, as the agencies themselves state, seem to reflect or at least take into consideration all the macroeconomic fundamentals, as they are supposed to be forward looking, meaning looking and rating through the business cycles and therefore they are set to represent our long term variable, which is tested for this ability to see through the business cycles and eventually predict defaults. It should be mentioned again that the agencies argue that they modify a rating when the likelihood of default changes significantly and this change is not purely transitory, but rather sticky.

4.3. 2ND VARIABLE: 1 YEAR DEFAULT LIKELIHOOD

The second variable is the estimate of 1 year default likelihood, calculated by Bloomberg. The method which is followed by Bloomberg for the estimation of this variable is based on a set of factors, which altogether are meant to provide a measure of health and credit quality of the issuers.

We further examine the nature and elements of this method to present an accurate description of the methodology which is followed. This model uses fundamental and market data from different sources to include all the available information so as to provide a complete picture of the credit quality and health of a firm in the most optimum way possible. It uses unique and quantifiable drivers of default, such as Merton's distance to default, interest coverage and market cycle information and therefore the default likelihood which is derived from the model is based not only on contemporaneous data, but also on historical data, unlike the default probabilities used by credit rating agencies. Couderc F. and Renault O. (2005) give emphasis to the use of historical data as main drivers to default probabilities. They give evidence that, while most structural and reduced form models tend to ignore long term business trends, economic trends and large past shocks and take into account only short term shocks, their results show that default is caused by their joint impact and therefore historical data should be incorporated in efficient models. Furthermore, they argue that legal procedures may delay the default event, a fact that is not usually captured by contemporaneous data.

4.2.1. FIRST DRIVER TO DEFAULT: Distance to Default

Even though it is not always clear and easy to define a default event, as such, one of the following three events is set in the framework:

- Failure to pay interest on an interest bearing corporate bond

- Bankruptcy filling

- Negative default resolution date

The first and main driver of default, which is estimated and is widely accepted and used for modeling purposes, is Robert Merton's distance to default. We further discuss the Merton's structural model for default (or the option theoretic approach model) in order to provide additional details of the methodology.

Merton sets as a solvent firm, the firm the value of the total assets of which is more than that of its liabilities. The assumptions of the model include the following:

- No transaction costs, taxes or relevant problems exist, meaning that the markets are frictionless

- Short sales are permitted

- Continuous trading in assets

- The asset values follow a geometric Brownian motion

$$dV_t = \mu_\tau V_t dt + \sigma_t V_t W_t \qquad (2)$$

Under these assumptions the equity of the firm (denoted with E) could be seen as a European call option on the assets of the firm with strike price equal to its liabilities, since the value of the total assets cannot be directly derived from the market.

$$E = E^P (Max(V_T - D,0)) \qquad (3)$$

Where:

1. D stands for total liabilities

2. E^P stands for the expectation under real measure

The differentiation that the Bloomberg model makes is that it views default as the probability that a company could default any time before t, unlike the Merton model which places the probability of default exactly at the time t. Thus, equity in the Bloomberg model is seen as a barrier option on the residual assets of the firm.

$$E = E^P (Max(V_T - D,0)) 1_{min(V_t) \triangleright D} \qquad (4)$$

Where 1 is the indicator function

Thus, the parameter which occurs from the option theoretic framework is called distance to default and is estimated for a horizon of one (1) year, according to Bloomberg adjustment, since it takes into

consideration the accounting definition of short term debt, which is the debt that matures within a fiscal year. The equation is shown below:

$$DD = \frac{E^P(\ln(V_T)) - \ln(D)}{\sigma\sqrt{T}} = \frac{\ln\frac{V_t}{D} + (\mu - \frac{\sigma^2}{2})T}{\sigma\sqrt{T}} \qquad (5)$$

Where,

V_t depicts the total asset value of the firm at time t

σ depicts the total return volatility

μ depicts the drift

D depicts the total liabilities of firm

T depicts the time to maturity

DD depicts the distance to default

E^P V_t depicts the expectation of asset value at time T under real measure P.

According to the model the smaller the distance to default of a firm is, the closer it is to default. It should be also stated that the actual probability of default is a complicated nonlinear function of distance to default. Furthermore, the size of the firm seems to have an effect on distance to default, as higher (lower) distances to default are associated with larger (smaller) firms, since these firms usually have lower (higher) probabilities of default. Another factor that affects distance to default is where the firms are in the business cycle. According to the data of the Bloomberg database, two observations could be made:

1. In periods where the number of defaults increases (mainly in recessions), the distance to default decreases and vice versa.

2. During the lowest points of business cycle (troughs), the distances to default are lower and the number of defaults is higher and vice versa.

4.2.2. SECOND DRIVER TO DEFAULT: Interest coverage ratio

While distance to default is based solely on the balance sheets of the firms, to present results that quantify default and make predictions, Bloomberg model also incorporates the income statements of the firms in order to use more information and thus improving its prediction ability. To be more specific it incorporates the interest coverage ratio (EBIT/Interest Expenses) and the relationship between the ratio and the probability of default is described as follows: the higher the ratio, the lower the actual default and vice versa.

It should be noted that while the accounting practices among firms and the variety of off-balance sheet activities create difficulties in comparing the fundamentals of the firms accurately, the model makes adjustments to reported financial data in order to overcome such difficulties, thus enabling comparisons in a consistent way. Its main adjustments concern:

- Operating leases
- Pension and other post employment benefits

4.2.3. THIRD DRIVER TO DEFAULT: VIX index

The third and last driver of default, which is used by Bloomberg to estimate the one year default likelihood, is the Chicago Board Options Volatility index or VIX. This index was originally designed to measure the market's expectation of 30-day volatility implied by at-the-money S&P 100 Index (OEX) option prices. In 2003 the VIX index was updated in cooperation with Goldman Sachs and since then, based on the S&P 500 Index (SPX$_{SM}$), it estimates expected volatility by averaging the weighted prices of SPX puts and calls over a wide range of strike prices reflecting in this way the market's expectations of future volatility. It is also known as the fear index, as it is a factor that captures mainly unusual systemic risk.

As far as its calculation is concerned VIX like all indexes adapts rules for selecting component options and a formula to calculate index values.

The generalized formula used in the VIX calculation, which is presented in the white paper of Chicago Board Options Exchange[6] is the following:

$$\sigma^2 = \frac{2}{T} \sum_i \frac{\Delta K_i}{K_i^2} e^{RT} Q(K_i) - \frac{1}{T}(\frac{F}{K_0} - 1) \qquad (6)$$

Where,

σ equals VIX/100

T is time to expiration

F is the forward index level derived from index option prices

K0 is the first strike below the forward index level, F

Ki is the strike price of ith out-of-the-money option; a call if Ki>K0 and a put if Ki< K0; both put and call if Ki=K0.

ΔKi is the interval between strike prices – half the difference between the strike on either side of Ki:

$$\Delta K_i = \frac{K_{i+1} - K_{i-1}}{2} \qquad (7)$$

(Note: ΔK for the lowest strike is simply the difference between the lowest strike and the next higher strike. Likewise, ΔK for the highest strike is the difference between the highest strike and the next lower strike.)

R is the risk-free interest rate to expiration

Q(Ki) is the midpoint of the bid-ask spread for each option with strike Ki.

This driver of default, as it was previously stated, captures the worst scenarios in the economy and therefore is also included in the Bloomberg model.

Lastly, it should be mentioned that this model, as analytically described above, has been tested using specific case studies and statistical tests (using the accuracy ratio test) and the results were satisfactory. For further information one can also read the Bloomberg CRAT white paper.

4.4. 3RD VARIABLE: BLOOMBERG ISSUER RATINGS

The third variable which is selected for the analysis is the Bloomberg credit ratings. Bloomberg ratings are based on the level of the default likelihoods and each rating corresponds to a unique range

of one year default likelihoods. The highest rating is AAA and the lowest non defaulted firm rating is C1. Defaulted firms are assigned DDD. L represents low, while H represents high and numerals reflect the number of the letters .The investment grade barrier is set at B3L and higher.

It should be stressed, however, that neither Bloomberg Finance L.P. nor its affiliates is a Nationally Recognized Statistical Rating Organization (NRSRO) in the United States or in any other country yet. Furthermore, it should be also pointed that the ratings that are provided by Bloomberg are unsolicited and the issuers do not pay any fees in order to be rated or rate their securities, which is another difference between Bloomberg and the credit rating agencies.

The Bloomberg ratings and the specific ranges they correspond to are depicted at figure 1 below, while figure 2 contains the Bloomberg ratings in comparison to S&P's ratings and their classification for the description purposes of the graphs that follow.

Figure 1

Figure 2

BLOOMBERG RATING	PROBABILITY RANGE
AAA	0.0000% - 0.0030%
A2H	0.0030% - 0.0040%
A2	0.0040% -0.0070%
A2L	0.0070% -0.0090%
A1H	0.0090% -0.0130%
A1	0.0130% -0.0190%
A1L	0.0190% -0.0270%
B3H	0.0270% -0.0650%
B3	0.0650% -0.1320%
B3L	0.1320% -0.2500%
B2H	0.2500% - 0.330%
B2	0.3330% -0.4160%

BLOOMBERG RATING	S&P's RATING	CLASSIFICATION
AAA	AAA	1
A2H	AA+	2
A2	AA	3
A2L	AA-	4
A1H	A+	5
A1	A	6
A1L	A-	7
B3H	BBB+	8
B3	BBB	9
B3L	BBB-	10
B2H	BB+	11
B2	BB	12

B2L	0.4160% -0.4990%	B2L	BB-	13
B1H	0.4990% - 1.0530%	B1H	B+	14
B1	1.0530% -1.6020%	B1	B	15
B1L	1.6020% - 2.1450%	B1L	B-	16
C3H	2.1450% - 2.8730%	C3H	CCC+	17
C3	2.8730% - 3.5910%	C3	CCC	18
C3L	3.5910% - 4.2980%	C3L	CCC-	19
C2	4.2980% - 7.7080%	C2	CC	20
C1	7.7080% - 100.00%	C1	C	21
DDD		DDD	D	22

4.5.   METHODOLOGY AND QUALITATIVE ANALYSIS

The methodology of our analysis is simple, yet it should be mentioned again that the data which were previously described are a result of complicated models, which include among others an option pricing theoretic model approach.

Our qualitative analysis is structured as follows: for each firm of the sample the data (the three variables previously described) are all depicted in a graph, which shows their development across the timeframe which was chosen (1999-2010). Our purpose is to detect patterns of procyclicality across the S & P's rating scales, which mean to shed some light in the way that the credit rating agencies assign ratings to issuers (firms or countries) or securities, and evaluate whether the agencies actually rate through the business cycles.

In the time framework that we set for our study, NBER records two periods of recession for the US economy. More generally, the beginning of each recession starts at the peak of a business cycle and ends at the through. The first recorded recession began at March of 2001 and ended at November of 2001 following a period of 10 year expansion, while the second period of recession began at December of 2007 and ended at June of 2009. Philip Low (2002) notes that while some expansions

in the business cycle can be classified as having very low levels of credit risk, there could be others that are characterized by relatively higher levels of credit risk, when higher and rapid credit growth is present, along with increases in asset prices and high levels of investment, thus potentially creating financial imbalances, which could lead to recessions. Therefore, even though there are two recessions in our framework, it does not mean that their characteristics are the same and that all companies of the sample should be affected in the same pattern.

For each rating category the graphs are placed side by side so as to be able to compare them and they begin with the presentation of the firms with the higher rating and descend until the B- S&P's category. Note that the scale which is used to introduce the data for all the three variables which we study is the same across the diagrams in order to be able to detect differences among the rating classes. In particular, the left x axis presents the data for the one year probability likelihood, while the right x axis presents the rating classes as they were classified in figure 2 above.

| 1-Yr DEFAULT | BLOOMBERG | S & P's |
| LIKELIHOOD(%) | RATINGS | RATINGS |
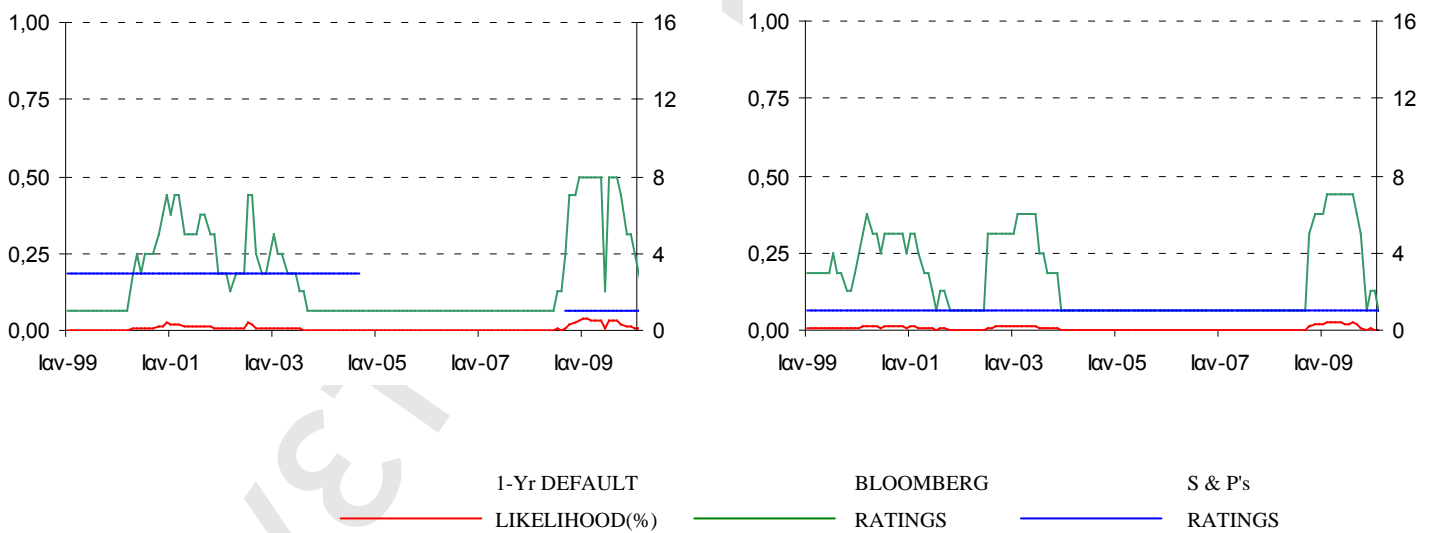
The first two graphs depict the data of the three variables we used, as previously described for AAA rating category. The most stable curve of the two graphs, as it is expected depicts the S&P's ratings. As it can be easily seen from the graphs, even though it has been also pointed out in the previous section, the Bloomberg rating curve follows the same direction with the one year default likelihood, as these ratings are linked to specific one year default likelihood ranges, so when the default likelihood rises the firm is downgraded at the same time and vice versa. So, our analysis will be mainly concentrated on the S&P's rating curve compared to the one year default likelihood curve.

The results for this first rating scale are quite expected. Firms that are assigned AAA rating tend to present very low probabilities of default, which are not so volatile, as both graphs show. It should be noted that even though there are two recessions reported by NBER, as we previously described, not all the firms of the sample reacted to the first recession in the same pattern, but they all responded to the second and most recent recession at the exactly same way, as for this period all the probabilities of default increased, to the extent, of course, which was proportional to their fundamentals.

It should be mentioned that, for reasons that are not discussed in this study and concern mostly analysis at the microeconomic-firm level, the first company stopped being rated from October of 2004 to August of 2008. However, it should be stated that firms may fall into the not rated (n/r) category for various reasons. For example the rated firm could be acquired by another firm or it could just decide not to be rated by S&P's anymore. However, as S&P's states these firms are not defaulted, even though their credit quality is not known for this period. That fact should not significantly influence our analysis, since it appears only for this particular firm, while for two more firms S&P's did not provide solicited ratings from the beginning of the period mentioned, because the firms themselves did not need to be rated. So our analysis will be focused only at the periods where this firm was rated and in fact our analysis concerns mainly the period from 2008 and forward, as this change in grade does not necessarily mean revaluation, as it is considered by the agency as a new issuance of rating.

For both firms we note that the S&P's ratings show stickiness and the default probabilities, as mentioned before, are not significantly volatile, which is also reflected in the Bloomberg rating curve. The first company was upgraded in 2008 but as already mentioned there is no continuous rating history from S&P's. However, its probabilities of default for that period could most probably justify such an upgrade from AA immediately to AAA, meaning an upgrade of two notches. These

results are also consistent with a number of papers that all conclude that for the higher grades no procyclicality is evidenced, but this does not mean that the risk assessment procedures and rating criteria of the credit rating agencies are verified for their effectiveness.


1-Yr DEFAULT	BLOOMBERG	S & P's
LIKELIHOOD(%)	RATINGS	RATINGS
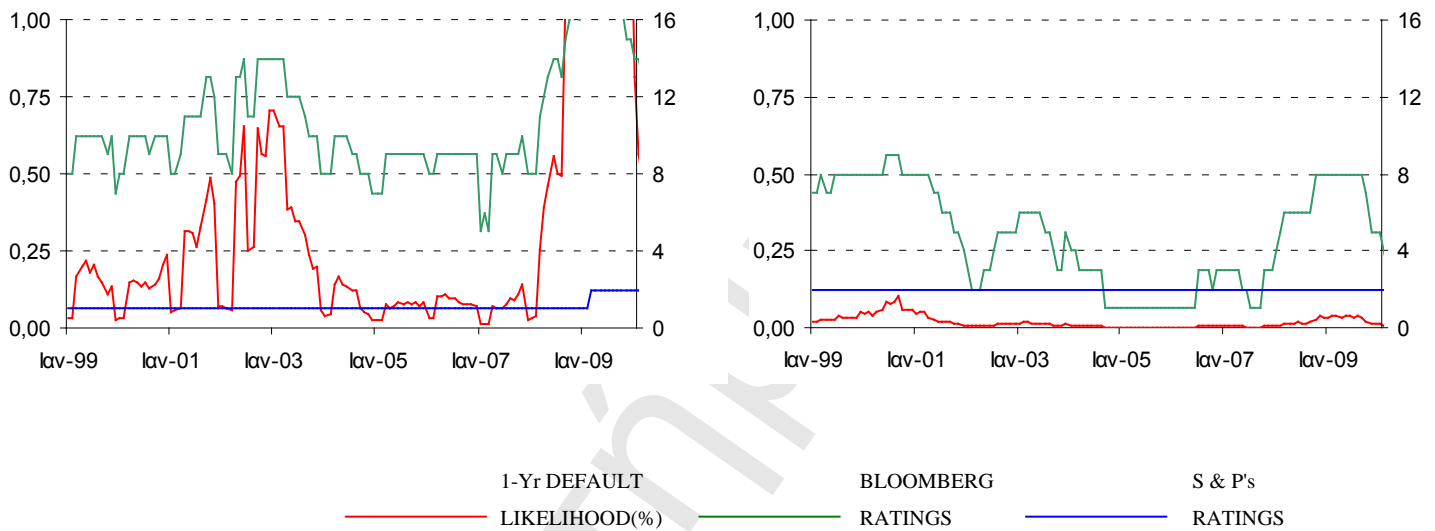
The next two firms are rated with AA+ grade. However, their graphs depict differences between them, but there are minor differences between those firms and the AAA rated firms above, as far as procyclicality is concerned.

To be more specific, both firms present stability in their agency ratings, as the previous two firms. The first firm was downgraded on March of 2009, after continuous, significant increase in the default likelihood since April of 2007. So, the fundamentals of the firm along with the macroeconomic environment, as this period has been classified as a recession period, must have lead to the S&P's decision for revaluation of the grade, which eventually dropped to one notch. However, this is a standard procedure that credit agencies follow and does prove, at least for this particular example that they rate through the cycle and do not present procyclical elements. The firm on the right side, unlike the other, presents the same features as the AAA rated companies, as it rating is the same for all this period, whereas the default likelihood shows more volatility than the previous ones.

| 1-Yr DEFAULT LIKELIHOOD(%) | BLOOMBERG RATINGS | S & P's RATINGS |
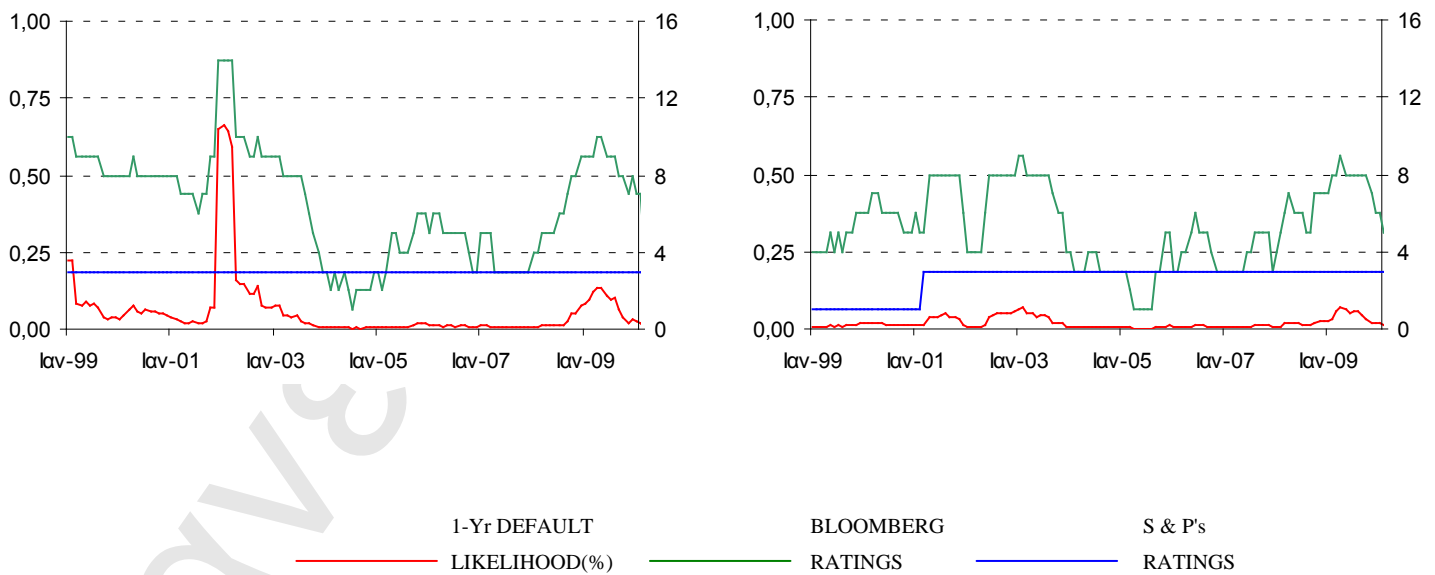
Examining the graphs from the AA category, we could detect differences in the rating process between those two firms, which could, however, be attributed to differences in the qualitative elements of each firm, which cannot be captured by the Bloomberg model, as it uses purely quantifiable variables.

Both firms present increased probabilities of default during both recession periods. But, while the first firm presented significantly higher default likelihoods during the first recession, there was a downward migration for the second firm for two notches, even though the estimated default likelihoods were lower. In fact, it could be argued that signs for procyclicality are evidenced for that period, as the downgrade was followed by the increase in the default likelihoods and not vice versa. In fact, the month in which the downgrade took place could probably trigger the increase in the defaults likelihood and amplify the effects, as this downgrade would influence the volatility of the share prices and ultimately the distance to default. But it is obvious, that this evidence is not strong enough to result to conclusive and clear cut conclusions.
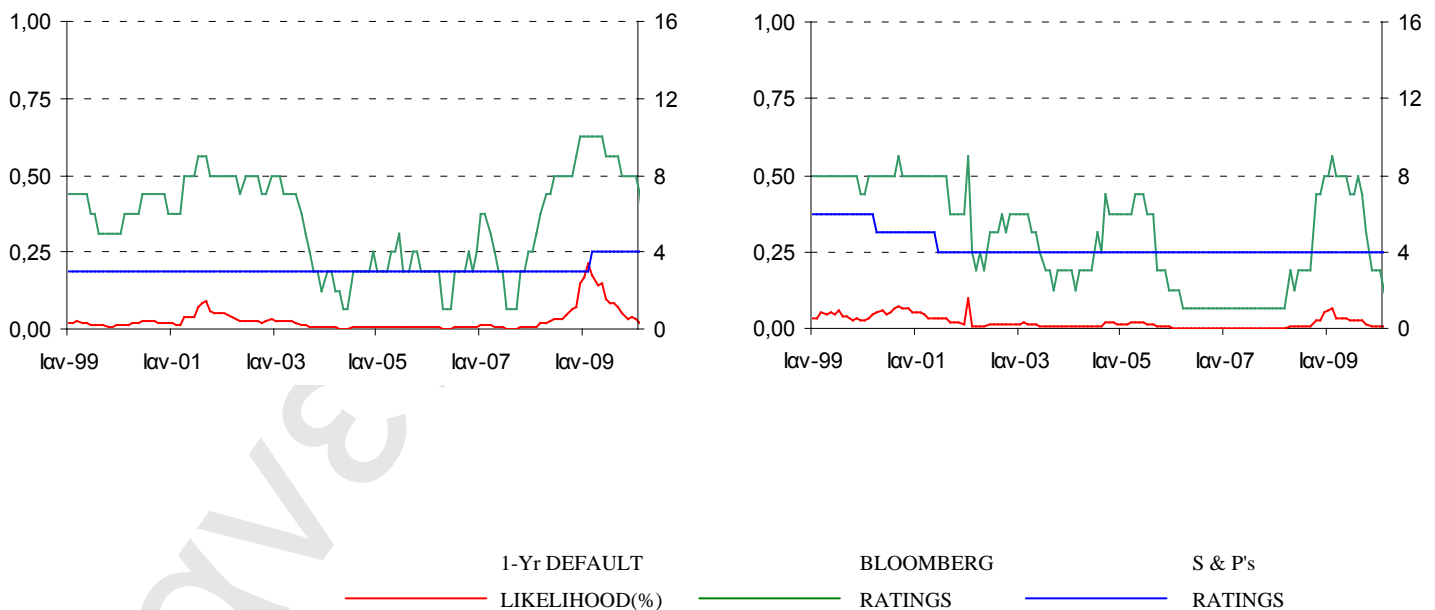
Studying the AA- rating class, our analysis does not present significant differentiations from the higher rating categories as far as the left firm is concerned. The downgrade of the left firm seems to be a result of rather persistent and increasing default likelihoods, combined with the face of the economy during the same period.

The right firm, however, was upgraded twice in almost one year at the early years of the previous decade, even though, as the graph clearly shows, the one year probabilities of default of the same period are among the highest and more persistent of the time framework set by our study for this particular firm. This upgrading which was followed by another upgrade, without evidence captured by our model poses questions about the reasons that lead to such decisions and about the risk assessment methods the agencies use in order to assign grades. However, one could argue that the picture we have is incomplete, since we do not have data before 1999 and so the pattern could be different, for example if before that period the probabilities of default were even higher and showed improvement which could result to this upgrade and the second upgrade could be a result of more stable and lower default likelihoods. Loffler (2002) showed that rating migration could be explained by past rating changes provided new information is controlled for. The serial rating changes could all refer to the same reason again and again. So, this could be an explanation.
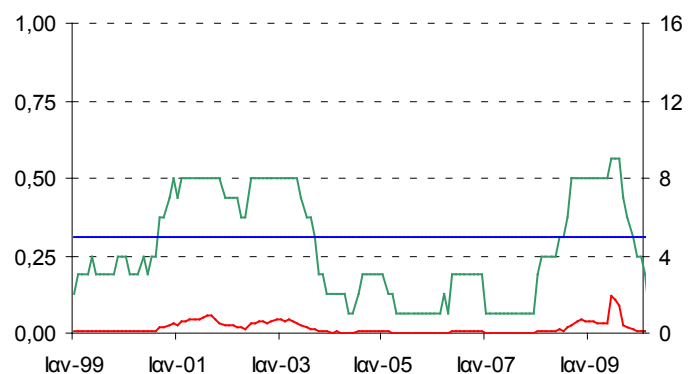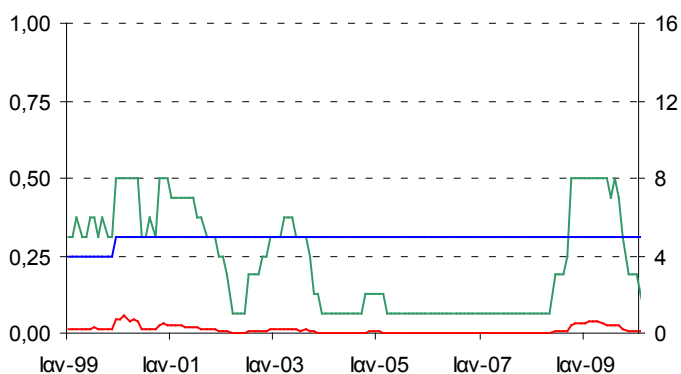
The analysis of the A+ rating class could be the same as the analysis for the AA class, since the patterns of the curves seem to be the same.

Even though the S&P's rating curve is stable for the left curve, no matter how volatile the monthly one year default likelihoods seem, the left graph seems to capture evidence of procyclicality, since the higher default probabilities could be triggered by the downgrading and not cause it. The difference between this evidence of procyclicality and the previous one is that S&P's downgraded this firm at a different stage of the business cycle, while still experiencing an expansion period, unlike the AA rated firm which was downgraded during recession.

1-Yr DEFAULT   BLOOMBERG   S & P's
LIKELIHOOD(%)   RATINGS   RATINGS
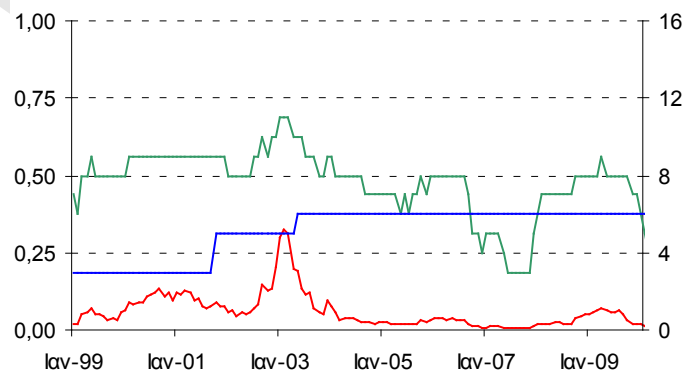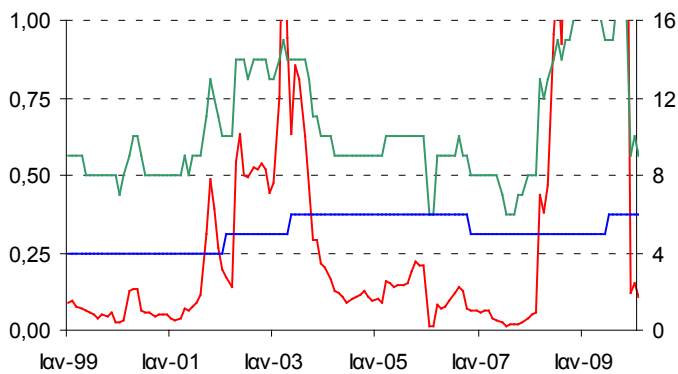
It is quite evident that the lower the categories, the more volatility the default likelihoods present, as our diagrams depict. Furthermore, as we descend the rating classes, S&P's curves seem to be less stable, meaning that grade migrations become gradually more often. This fact alone could also be a sign that not all variables are clearly captured by the methodologies the rating agencies use. According to results of Loffler's tests even if rating agencies are provided with all the available information and use them in an efficient way, meaning that they are incorporated into ratings on time, ratings will not predict defaults in the most optimum way. Thus, the result could be a consequence of agencies' rating methodologies, which is a conclusion that also Carey and Hryclay make, but alternatively it could be attributed to the fact that agencies seem to consistently underreact to new information. Gouderc F. and Renault O. (2005) in their paper suggest that the default cycles are longer than the business cycles and that some persistency has to be incorporated. Furthermore, they note that the tendency from the agencies to overestimate default probabilities on low grades is due to inability of traditional factors to explain the significant number of defaults observed in the previous default crisis of 2001.

The firm on the left side presents high variation in its default likelihood curve, while the other firm presents intense variation during the same period in which it is downgraded and its default probability curve becomes more stable after the last downgrade. Both graphs seem to confirm that either agencies tend to overestimate default probabilities as the grades lower, or their methods seem to produce rather non satisfactory results from the current methodologies they use, since their grades ought to be more stable, as they state that they rate through the cycle.

1-Yr DEFAULT LIKELIHOOD(%) — BLOOMBERG RATINGS — S & P's RATINGS
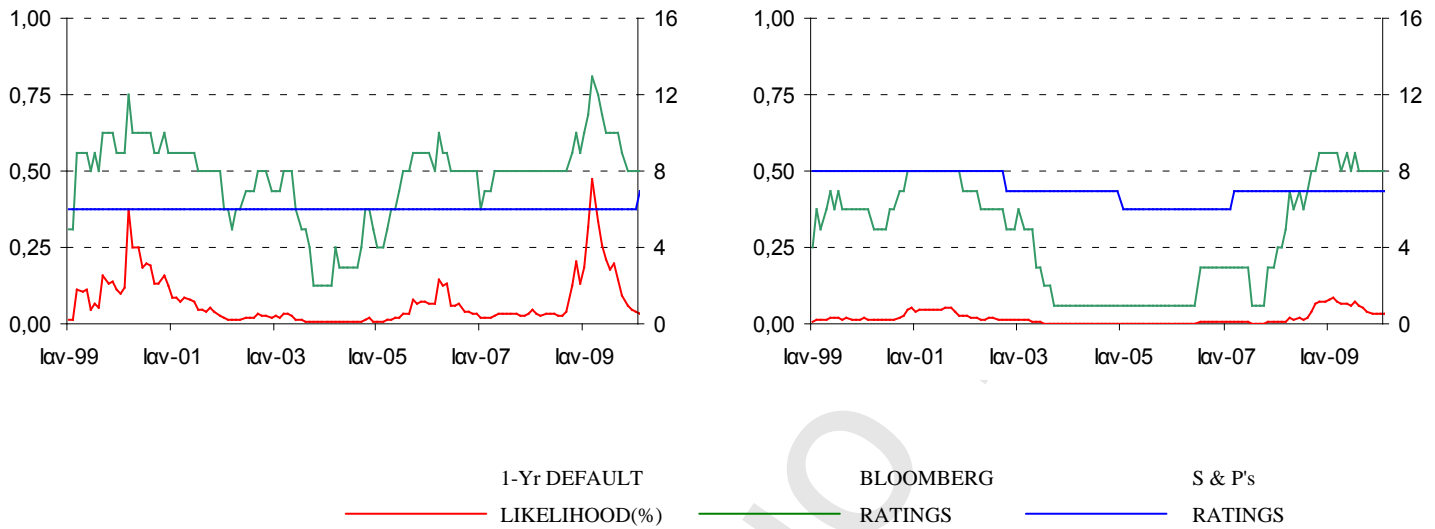
Even though we investigate the A- category, it seems that the variables depicted present more stability than those of the previous category (A category). The firm on the right side was downgraded on February of 2010, after presenting high levels of default probabilities during the last recession, being at their peak on March of 2009 and descending constantly afterwards. This finding could verify Loffler observation that the agencies underreact to new information. The firm at the left side is imposed to three upgrades of two notches, followed by a downgrade of one notch, but no signs of procyclicality are captured, since its default probability curve is quite stable, except for the two recessions.

|	1-Yr DEFAULT	BLOOMBERG	S & P's
	LIKELIHOOD(%)	RATINGS	RATINGS
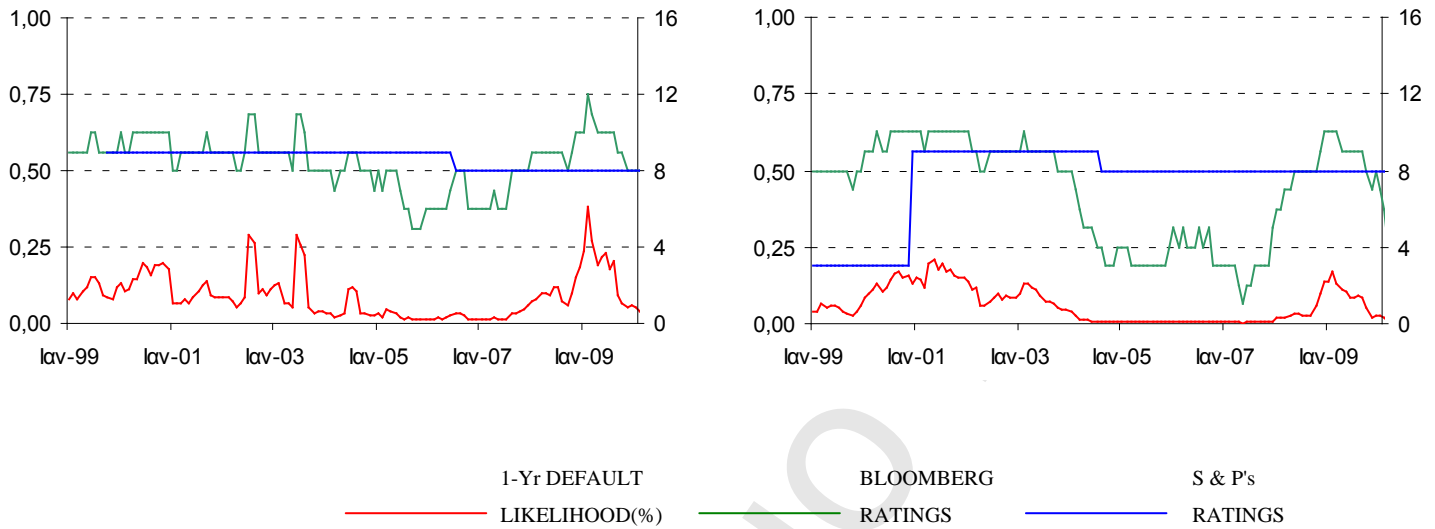
As we move to lower ratings and come closer to non investment grade scale (BBB+ category), there seem to be some misspecifications in the agencies' rating methodologies, at least as far as the firm on the right is concerned, as the instant downgrade is remarkable (from AA to BBB) and could not be explained if we compare its data to the data of the firms depicted in the previous graphs. However, Loffler also found that rating changes could be unrelated to new information, if this information does not affect current-condition probabilities of default in a significant way, but has a rather important impact on the permanent components of an issuers credit quality, thus making credit ratings react strongly.

	1-Yr DEFAULT	BLOOMBERG	S & P's
	LIKELIHOOD(%)	RATINGS	RATINGS
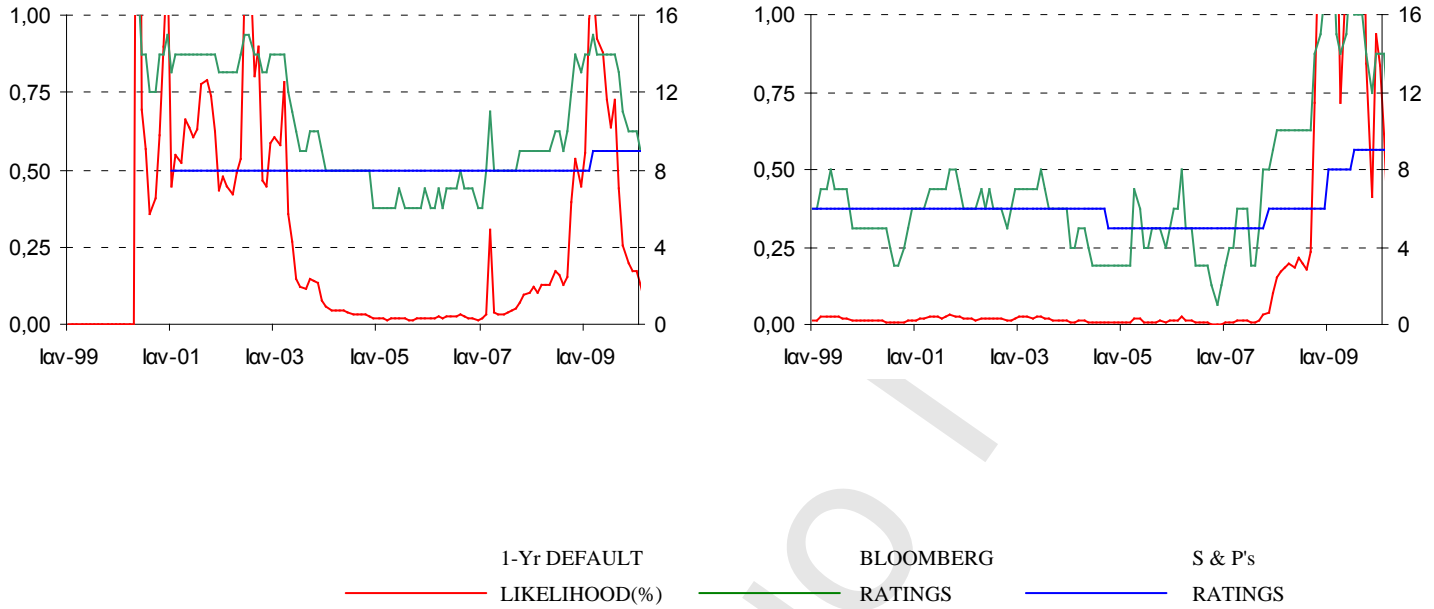
The graphs of the two companies rated with BBB, show that the default likelihood curves could be significantly volatile, especially during the recessions. But, while the firm at the left side presents stable S&P's rating curve and the downgrade has followed the sharp increase in the default likelihood, for the firm at the right side procyclicality could explain the rest of the graph or at least trigger the repeated downgrades as the first downgrade which coincides with the beginning of the last recession was almost instantly followed by significant increase of the default likelihoods.

| 1-Yr DEFAULT	BLOOMBERG	S & P's
LIKELIHOOD(%)	RATINGS	RATINGS
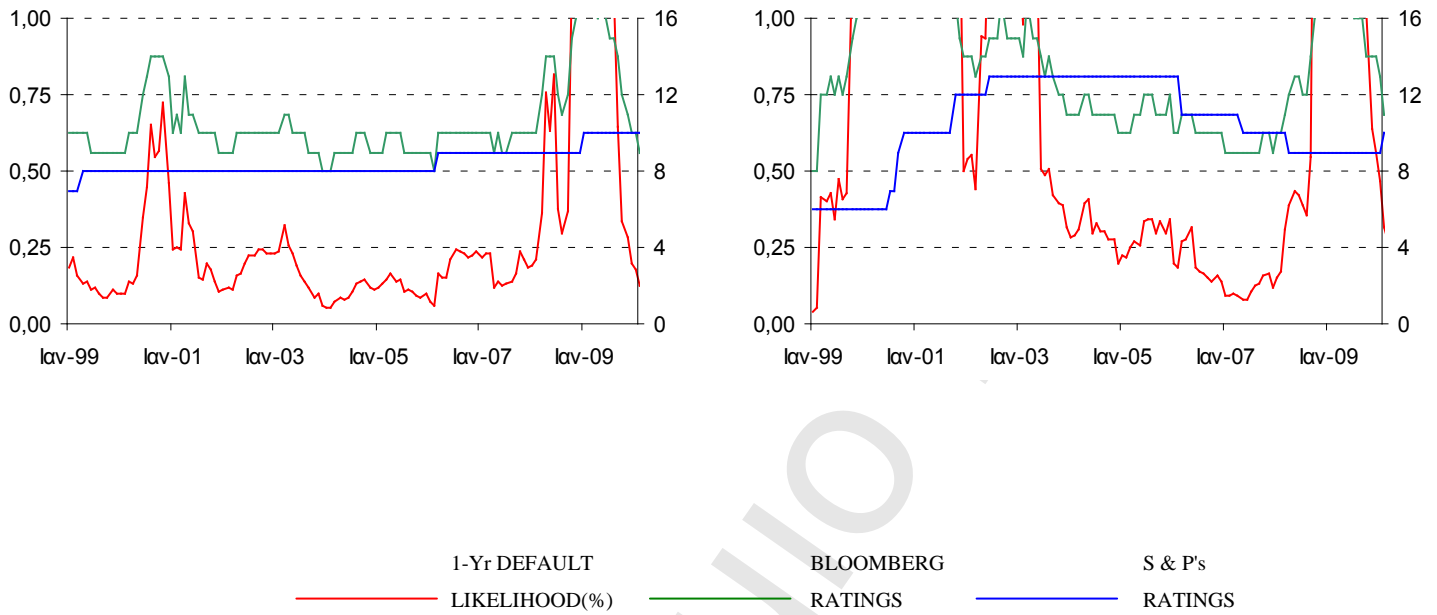
These graphs depict our results for the last investment grade firms. The differences between them are obviously significant. Both of them have extremely volatile default likelihood curves. The S&P's rating curves are volatile as well, especially for the firm at the right side. The graph for the right side firm consists an example of how the agencies overreact to extreme increases in the default probabilities and thus do not rate through the cycle, at least in this case, as the continuous downgrade, eventually below investment grade, was followed by a period of several upgrades.

|	1-Yr DEFAULT	BLOOMBERG	S & P's
	LIKELIHOOD(%)	RATINGS	RATINGS
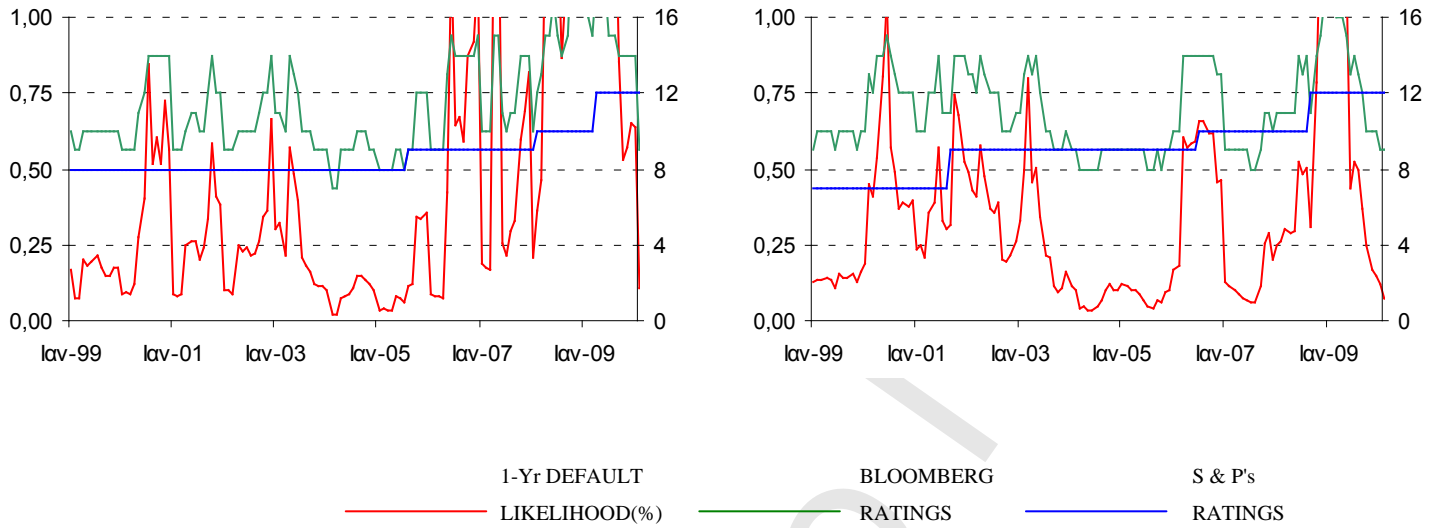
As both graphs show, these non investment grade firms, assigned with BB+ rating, have extremely volatile default probability curves throughout the whole period that is examined. It should be mentioned, however that all non investment grade firms have very volatile default likelihood curves, which highlights their higher credit risk. For the firm at the left side there are no cyclicality signs at all, while for the other firm we could imply that there are weak signs of procyclicality depicted for the first downgrade, but we could not really conclude if the probabilities of default were actually triggered by the downgrade itself or were a result of the company's fundamentals and its performance during that period.
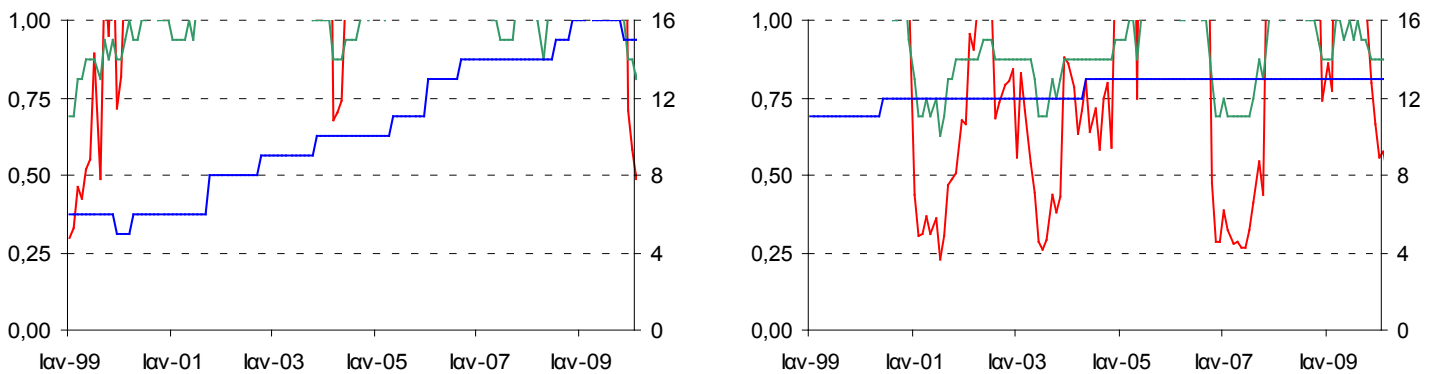
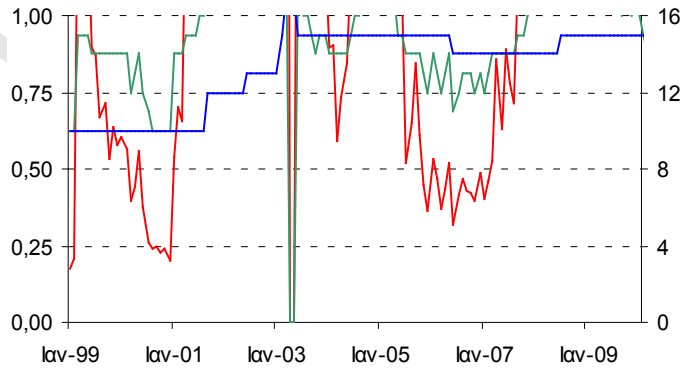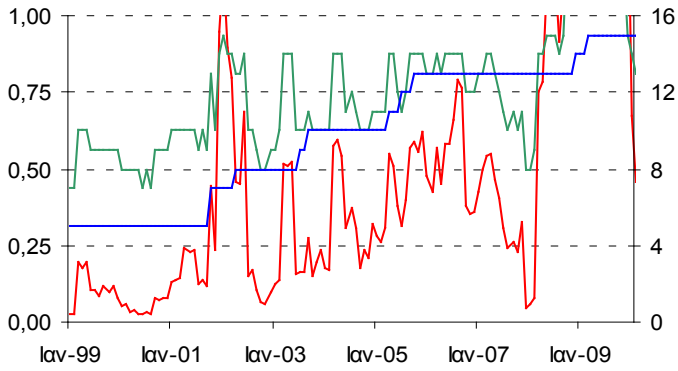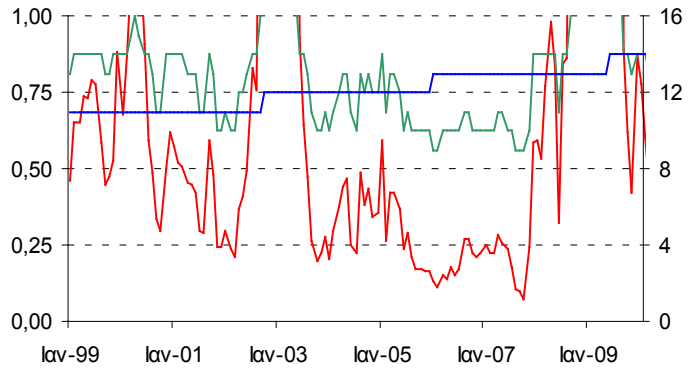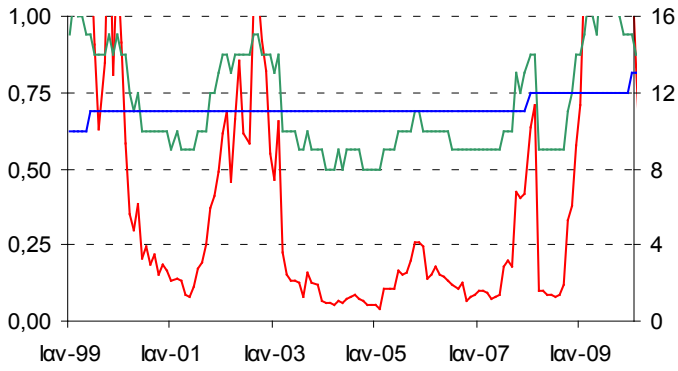|	1-Yr DEFAULT	BLOOMBERG	S & P's
	LIKELIHOOD(%)	RATINGS	RATINGS
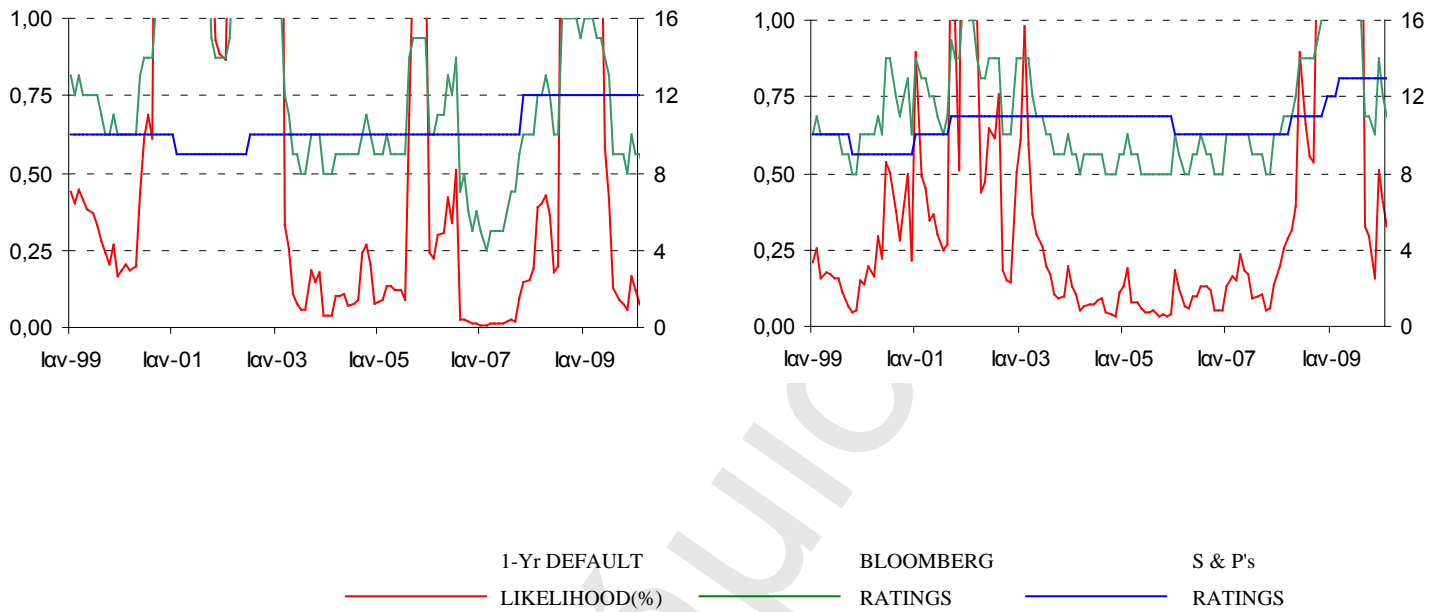
These firms had BBB+ rating at the beginning of the period, which is examined and were considered as investment grade firms. Actually they were upgraded during the early 00's, for reasons, however, that do not seem to be captured by our curves as for these periods the default likelihoods were actually increasing, which additionally erases questions about their statement of rating through the cycle. During the last recession, however, they were both classified as non investment grade firm

1-Yr DEFAULT	BLOOMBERG	S & P's
LIKELIHOOD(%)	RATINGS	RATINGS
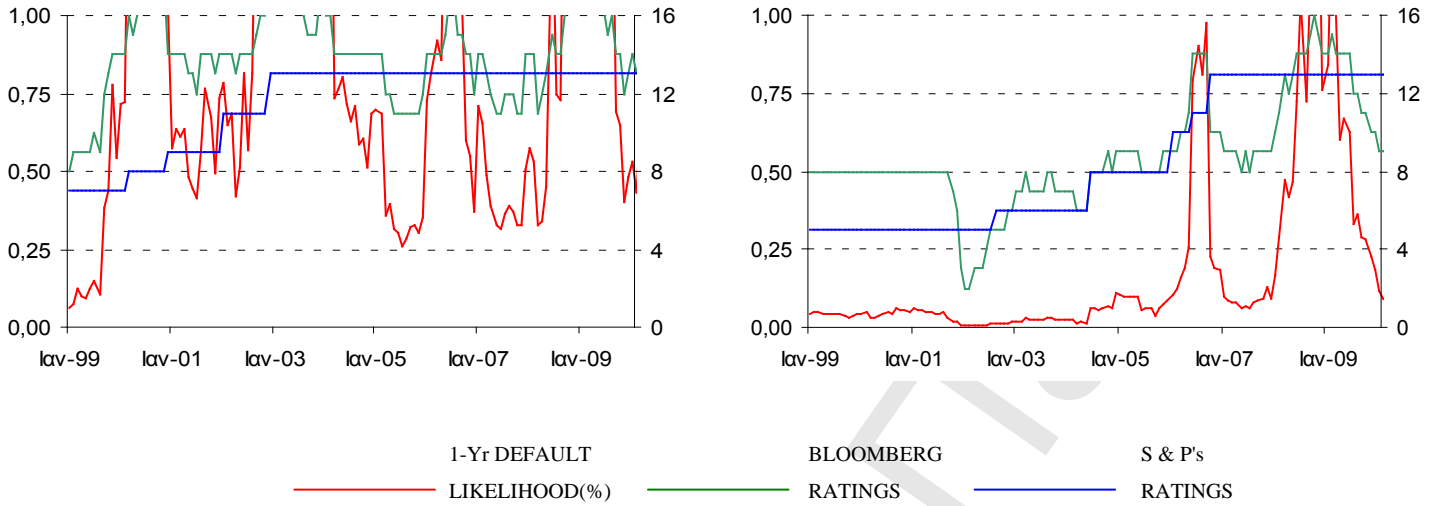
BB- category includes two firms which were gradually downgraded and migrated to the non investment grade class. However, while for the first firm at the left, the situation is quite obvious, it is not the same for the second firm. For this firm it is interesting that it's default likelihood curve was not as volatile as the one of the non investment firms, but the first two downgrades accelerated the increase in the default likelihoods and thus eventually drove it to the non investment grade classification. In this case procyclicality effects could be more clearly evidenced.

1-Yr DEFAULT	BLOOMBERG	S & P's
LIKELIHOOD(%)	RATINGS	RATINGS

The last three categories are examined together since their results are common, except for two firms, the firm graded with B+ at the left and the firm rated with B- at the left, as well.

For the four remaining firms it should be fair to say that being in the non investment grade area at the beginning of the period we examine and throughout the whole decade, their results are quite expected and not so significant. For the volatility their default likelihoods present their S&P's rating curves are quite stable. The migrations which are documented concern only downgrades, expect for the upgrade that is observed for the last firm of the sample before the last recession. Another common feature is that they were all downgraded during last recession at different periods, of course.

As far as the two firms is concerned, it is quite impressive how volatile the S&P's rating curves are, meaning that these two firms have been continuously downgraded at the same period, both beginning from 31/10/2001. Secondly, both of them had quite high investment grades at the beginning of 1999. It should be noted that as far as procyclicality is concerned, there are no evidence at all, since the sharp volatilities of default likelihood could easily trigger a downgrade. However, it is quite clear that the credit ratings had actually more short-term validity than long term, meaning that the agencies were unable to capture all the fundamentals of these firms in their models, which resulted in continuous misspecifications and did not rate through the cycle.

CONCLUSION

In this thesis our focus was to present the structure and functions of the credit rating agencies in the financial system and evaluate their methodology of rating through the cycle. Furthermore, by developing an empirical model we focused on the influence of procyclicality in the rating assignment process and the ability of the credit rating companies to rate through the cycle.

Our model included three variables, which in our opinion summarize the main factors which reflect the corporate and market fundamentals along with the macroeconomic data that are believed to be captured by the credit rating agencies. S&P's ratings consisted our first variable. One year default likelihood, our second variable, is modeled by using the Merton's model of distance to default estimations along with the interest cover ratio and the VIX. Bloomberg ratings, our third variable are tight to one year default likelihood uniquely at specific ranges. These variables were depicted in graphs and are compared per rating category.

Our results showed some small evidence of procyclicality, which, however, do not follows a certain pattern or appears for a certain category. Thus, we cannot conclude that procyclicality is the reason for credit ratings misspecifications. Some results show irregularities or misspecifications in the rating methodology and their ability to rate through the cycle is questioned but there must be some other factors which seem to influence credit ratings. It seems that the current survey should turn to other aspects, besides the macro environment.

ENDNOTES

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[1] The News Hour with Jim Lehrer: Interview with Thomas L. Friedman (PBS television broadcast, Feb. 13, 1996)

[2] Patrnoy Frank (1999), see references No. 25

[3] Basel Committee on Banking and Supervision, 2000 see references No. 6

[4] Cantor R. and Packer F. (1994), see references No 9

[5] IMF (1999), see references No 15

[6] Please, for more information see "More than you ever wanted to know about volatility swaps" by Kresimir Demeterfi, Emanuel Derman, Michael Kamal and Joseph Zou, Goldman Sachs Quantitative Strategies Research Notes, March 1999.

ANNEX 1

Standard & Poor's Issuer Ratings and Definitions

An S&P's Issuer Credit Rating is a current opinion of an obligor's overall financial capacity (its creditworthiness) to pay its financial obligations. This opinion focuses on the obligor's capacity and willingness to meet its financial commitments as they come due. It does not apply to any specific financial obligation, as it does not take into account the nature and provisions of the obligation, its standing in bankruptcy or liquidation, statutory preferences, or the legality and enforceability of the obligation. In addition, it does not take into account the creditworthiness of the guarantors, insurers, or other forms of credit enhancement on the obligation. The Issuer Credit Rating is not a recommendation to purchase, sell, or hold a financial obligation issued by an obligor, as it does not comment on market price or suitability for a particular investor. Counterparty Credit Ratings, ratings assigned under the Corporate Credit Rating Service (formerly called the Credit Assessment Service), and Sovereign Credit Ratings are all forms of Issuer Credit Ratings. Issuer Credit Ratings are based on current information furnished by obligors or obtained by S&P's from other sources it considers reliable. S&P's does not perform an audit in connection with any Issuer Credit Rating and may, on occasion, rely on unaudited financial information. Issuer Credit Ratings may be changed,suspended, or withdrawn as a result of changes in, or unavailability of, such information, or based on other circumstances. Issuer Credit Ratings can be either long term or short term. Short-Term Issuer Credit Ratings reflect the obligor's creditworthiness over a short-term time horizon.

Long-Term Issuer Credit Ratings

AAA

An obligor rated AAA has extremely strong capacity to meet its financial commitments. AAA is the highest Issuer Credit Rating assigned by S&P's.

AA

An obligor rated AA has very strong capacity to meet its financial commitments. It differs from the highestrated obligors only in small degree.

A

An obligor rated A has strong capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.

BBB

An obligor rated BBB has adequate capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments. Obligors rated BB, B, CCC, and CC are regarded as having significant speculative characteristics. BB indicates

the least degree of speculation and CC the highest. While such obligors will likely have some quality and protective characteristics, these may be outweighed by large uncertainties or major exposures to adverse conditions.

BB

An obligor rated BB is less vulnerable in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments.

B

An obligor rated B is more vulnerable than the obligors rated BB, but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.

CCC

An obligor rated CCC is currently vulnerable, and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.

CC

An obligor rated CC is currently highly vulnerable.

Plus (+) or minus (–)

Ratings from "AA" to "CCC" may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories. An Issuer Credit Rating is withdrawn upon the first occurrence of any of the following events: (1) a payment default on any financial obligation, rated or unrated, other than a financial obligation subject to a bona fide commercial dispute; (2) a voluntary bankruptcy filing by the issuer or similar action; or, (3) in the case of banks, upon seizure of the bank by a regulator, or, in the case of insurance companies, upon placement of the insurer under regulatory supervision due to its financial condition.

Public Information Ratings

Ratings with a "pi" subscript are based on an analysis of an issuer's published financial information, as well as additional information in the public domain. They do not, however, reflect in-depth meetings with an issuer's management or incorporate material nonpublic information, and are therefore based on less comprehensive information than ratings without a "pi" subscript. Ratings with a "pi" subscript are reviewed annually based on a new year's financial statements, but may be reviewed on an interim basis if a major event that may affect an issuer's credit quality occurs. Ratings with a "pi" subscript are not modified with '+' or '-' designations. Outlooks will not be provided for ratings with a "pi" subscript, nor will they be subject to potential CreditWatch listings.

Short-Term Issuer Credit Ratings

A-1

An obligor rated "A-1" has strong capacity to meet its financial commitments. It is rated in the highest category by S&P's. Within this category, certain obligors are designated with a plus sign (+). This indicates that the obligor's capacity to meet its financial commitments is extremely strong.

A-2

An obligor rated "A-2" has satisfactory capacity to meet its financial commitments. However, it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in the highest rating category.

A-3

An obligor rated "A-3" has adequate capacity to meet its financial obligations. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.

B

An obligor rated "B" is regarded as vulnerable and has significant speculative characteristics. The obligor currently has the capacity to meet its financial commitments; however, it faces major ongoing uncertainties which could lead to the obligor's inadequate capacity to meet its financial commitments.

C

An obligor rated "C" is currently vulnerable to nonpayment and is dependent upon favorable business, financial, and economic conditions for it to meet its financial commitments. An Issuer Credit Rating is withdrawn upon the first occurrence of any of the following: (1) a payment default on any financial obligation, rated or unrated, other than a financial obligation subject to a bona fide commercial dispute; (2) a voluntary bankruptcy filing by the issuer or similar action; or (3) in the case of banks, upon seizure of the bank by a regulator, or, in the case of insurance companies, upon placement of the insurer under regulatory supervision due to its financial condition.

Local Currency and Foreign Currency Risks

Country risk considerations are a standard part of S&P's analysis for credit ratings on any issuer or issue. Currency of repayment is a key factor in this analysis. An obligor's capacity to repay foreign currency obligations may be lower than its capacity to repay obligations in its local currency, owing to the sovereign government's own relatively lower capacity to repay external versus domestic debt. These sovereign risk considerations are incorporated in the debt ratings assigned to specific issues. Foreign currency issuer ratings are also distinguished from local currency issuer ratings to identify those instances where sovereign risks make them different for the same issuer.

Rating Outlook Definitions

An S&P's Rating Outlook assesses the potential direction of a long-term credit rating over the intermediate to longer term. In determining a Rating Outlook, consideration is given to any changes in the economic and/or fundamental business conditions. An Outlook is not necessarily a precursor of a rating change or future CreditWatch action. *Positive* means that a rating may be raised. *Negative* means that a rating may be lowered. *Stable* means that a rating is not likely to change. *Developing* means a rating may be raised or lowered. *N.M.* means not meaningful.

CreditWatch

CreditWatch highlights the potential direction of a short- or long-term rating. It focuses on identifiable events and short-term trends that cause ratings to be placed under special surveillance by S&P's analytical staff. These may include mergers, recapitalizations, voter referendums, regulatory action, or anticipated operating developments. Ratings appear on CreditWatch when such an event or a deviation from an expected trend occurs and additional information is necessary to evaluate the current rating. A listing, however, does not mean a rating change is inevitable, and whenever possible, a range of alternative ratings will be shown. CreditWatch is not intended to include all ratings under review, and rating changes may occur without the ratings having first appeared on CreditWatch. The "positive" designation means that a rating may be raised; "negative" means a rating may be lowered; and "developing" means that a rating may be raised, lowered, or affirmed.

Source: Reproduced from www.standardandpoors.com.

ANNEX 2

Moody's Issuer Ratings

Foreign Currency

Moody's Foreign Currency Issuer Ratings are opinions of the ability of entities to honor senior unsecured financial obligations and contracts denominated in foreign currency. These ratings are subject to Moody's Foreign Currency Country Ceilings. Issuer Ratings are unlike Moody's long-term debt ratings in that they are assigned to issuers rather than specific debt issues. Specific debt issues of the issuer may be rated differently, and are considered unrated unless individually rated by Moody's. Unless specified, obligations guaranteed by the issuer are considered unrated and are not covered by the issuer rating.

Domestic Currency

Moody's Domestic Currency Issuer Ratings are opinions of the ability of entities to honor senior unsecured financial obligations and contracts denominated in their domestic currency.

Rating Symbols

Moody's rating symbols for Issuer Ratings are identical to those used to show the credit quality of bonds. These rating gradations provide creditors a simple system to measure an entity's ability to meet its senior financial obligations.

Aaa Issuers rated Aaa offer exceptional financial security. While the creditworthiness of these entities is likely to change, such changes as can be visualized are most unlikely to impair their fundamentally strong position.

Aa Issuers rated Aa offer excellent financial security. Together with the Aaa group, they constitute what are generally known as high grade entities. They are rated lower than Aaa entities because long-term risks appear somewhat larger.

A Issuers rated A offer good financial security. However elements may be present which suggest a susceptibility to impairment sometime in the future.

Baa Issuers rated Baa offer adequate financial security. However, certain protective elements may be lacking or may be unreliable over any great period of time.

Ba Issuers rated Ba offer questionable financial security. Often the ability of these entities to meet obligations may be moderate and not well safeguarded in the future.

B Issuers rated B offer poor financial security. Assurance of payment of obligations over any long period of time is small.

Caa Issuers rated Caa offer very poor financial security. They may be in default on their obligations or there may be present elements of danger with respect to punctual payment of obligations.

Ca Issuers rated Ca offer extremely poor financial security. Such entities are often in default on their obligations or have other marked shortcomings.

C Issuers rated C are the lowest rated class of entity, are usually in default on their obligations, and potential recovery values are low.

Moody's Short-Term Prime Rating System—Taxable Debt and

Global Deposits

Moody's short-term debt ratings are opinions of the ability of issuers to repay punctually senior debt obligations. These obligations have an original maturity not exceeding one year, unless explicitly noted. Moody's employs the following three designations, all judged to be investment grade, to indicate the relative repayment ability of rated issuers.

Prime-1

Issuers rated Prime-1 (or supporting institutions) have a superior ability for repayment of senior shortterm debt obligations. Prime-1 repayment ability will often be evidenced by many of the following characteristics:

· Leading market positions in well-established industries.

· High rates of return on funds employed.

· Conservative capitalization structure with moderate reliance on debt and ample asset protection.

· Broad margins in earnings coverage of fixed financial charges and high internal cash generation.

· Well-established access to a range of financial markets and assured sources of alternate liquidity.

Prime-2

Issuers rated Prime-2 (or supporting institutions) have a strong ability for repayment of senior shortterm debt obligations. This will normally be evidenced by many of the characteristics cited above but to a lesser degree. Earnings trends and coverage ratios, while sound, may be more subject to variation. Capitalization characteristics, while still appropriate, may be more affected by external conditions. Ample alternate liquidity is maintained.

Prime-3

Issuers rated Prime-3 (or supporting institutions) have an acceptable ability for repayment of senior short-term obligations. The effect of industry characteristics and market compositions may be more pronounced. Variability in earnings and profitability may result in changes in the level of debt protection measurements and may require relatively high financial leverage. Adequate alternate liquidity is maintained.

Not Prime

Issuers rated Not Prime do not fall within any of the Prime rating categories

Watchlist Definitions

UPG on Review for Possible Upgrade

DNG on Review for Possible Downgrade

UNC Direction uncertain

Source: Reproduced from www.moodys.com

Note: Moody's applies numerical modifiers 1, 2 and 3 in each generic rating category from Aa to Caa in the corporate finance sectors, and from Aa to B in the public finance sectors. The modifier 1 indicates that the issuer is in the higher end of its letter rating category; the modifier 2 indicates a mid-range ranking; the modifier 3 indicates that the issuer is in the lower end of the letter ranking category

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