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The Credit Derivatives Market

-an efficiency study

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Abstract

Title:	The Credit Derivatives Market, -an efficiency study
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Key words:	Credit derivatives, risk management, efficiency, financial innovations, asymmetric information, EMH, market microstructure.
Purpose:	Using both a theoretical and empirical perspective, our purpose is to investigate if the credit derivative market is efficient or not.
Method:	We sent a qualitative inquiry to 23 different market participants. To reach the purpose we analysed the answers and compared them with four different efficiency theories.
Conclusions:	We have noticed that the information efficiency is good in the market while immediacy, transparency, resiliency and depth are inefficient in the market. From the above, we state that the market is efficient from the EMH and financial innovation perspective. On the other hand if you look at market microstructure and asymmetric information the credit derivatives market is inefficient. If a market is total efficient all four theories must be fulfilled. Therefore we consider the credit derivative market inefficient.

Glossary

BIS: **B**ank of **I**nternational **S**ettlements. International central bank, that has produced guidelines for capital adequacy requirements. Member countries adapt these guidelines.

Credit event: A legal definition that is used to characterise the nature of the event that triggers the payout on a credit derivative. It includes such events as bankruptcy, default, and restructuring.

GAAP: **G**enerally **A**ccepted **A**ccounting **P**rinciples. The U.S standard method for accounting. Developed by the U.S authority, FASB (**F**inancial **A**ccounting **S**tandards **B**oard).

IAS: **I**nternational **A**ccounting **S**tandard. The European standard method for accounting. Developed by the London-based authority, IASC (**I**nternational **A**ccounting **S**tandards **C**ommittee).

ISDA: The **I**nternational **S**waps and **D**erivatives **A**ssociation. Has produced the ISDA Master Agreement, which is a standard legal documentation for financial transactions.

LIBOR: The **L**ondon **I**nter-**B**ank **O**ffered **R**ate. Rate, which banks lend, funds to each other on the international interbank market. Key rate, which is often used as a variable rate in swaps.

OTC: **O**ver-**T**he-**C**ounter. Transactions done, outside the regular market place.

Recovery-rate: The percentage of face value of an asset that a creditor will be able to recover (typically in bankruptcy) in the event of a default.

SPAK-model: The model created by the authors named by the initials. (**S**ven, **P**er-**A**nders, **K**las-Johan).

Spread: This is the word for the price per unit. The spread is calculated in basis points. Not to be mixed up with bid/ask-spreads.

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1. Introduction

This chapter gives a background to our thesis and defines problem, purpose and limitations. Finally, we present the disposition for the rest of the thesis.

1.1 Background

Credit risk is as old as lending itself, which means it dates back at least as far as 1800 B.C. The Hammurabi's Code is said to include many sections relating to the regulation of credit in Babylon.[1] Ever since banks were organized seven hundreds years ago in Italy, their core expertise have been managing credit risk. All the time banks have been very careful of their relationship with its customers, this of course since it is much easier to create solutions for someone you already know. In recent decades, this traditional approach has caused severe problems for many banks. It is obvious that banks have done a poor job of pricing and managing credit risk, probably caused, at least partly, by their too close relationship with its customers. Typically, a bank could be more concerned about the relationship to a customer than they are about the bank´s profitability. Sweden and the bank crisis during the early 1990s, can work as a good example for this assumption, many banks suffered from enormous credit losses, which was caused by incompetent risk management.

Of course, credit risk is nothing that only affects banks and financial institutions. Governments for example are also exposed to credit risk. This has recently been apparent in the Argentina crisis, where a debt of $ 132 billion[2], has caused problems for several governments and institutions worldwide.

Even if credit risk always has been seen as an important issue for many companies, it is most important for financial institutions. When times are bad and there is a downturn in the economy the defaults of companies follow as a direct consequence. During the last year we have seen an increased number of defaults, not only in the high technology sector but also in more traditional companies. This has led to and could lead to severe problems for those who have a large risk exposure to companies with high probabilities of default. There are several examples of this problem, for example Abbey National had to set aside £64m for the first half of 2001 to cover defaults in their portfolio, which was far higher than the £10m that was set aside the year before.[3] Another example is the huge energy group Enron who recently collapsed, which caused great losses for many big market actors such as JP Morgan and Citigroup. These examples show what great losses companies make if they do not hedge their credit risk exposure.

[1] Homer, S., Sylla, R., *A history of interest rates*, (1996).
[2] AP, *Argentina Leader Seeks Economic Fix*, (2002).
[3] Mackintosh, J., *Burns must avoid short step from black box to black hole*, (2001).

Already in the tail from the worldwide downturn, back in the mid 1980s, practitioners of credit risk management developed new techniques handling credit risk. This interest never led to any good solutions and it would take several years before any accepted solution was innovated.[4] The credit risk derivatives market started to develop 1996 and then it has grown very fast. It is paradoxically to notice that the market has developed in a period where the worldwide economies have had a substantial growth. According to British Bankers Association the total size of the credit derivatives market in the beginning of 2002 will be about $1.5 trillion.[5] Reading these figures, it is easy to realise that this is a fast growing and important market.

The credit derivative market as a financial innovation is meaningful in other ways than just hedging risk. As a well developed market it also can attract other types of investors than the traditional traders such as arbitrageurs. That has led to a new approach for credit risk; it is not any longer only a conservative concern but also an offensive opportunity.

1.2 Problem discussion

Credit risk has received much attention in the academic literature. Most of the works have focused on theoretical and mathematical valuation issues. The same is valid for the credit derivative market, where most of the research has been focused on pricing instruments. Examples of research papers trying to find a better pricing-model for credit derivatives are Longstaff & Schwartz[6], Das & Tufano[7], Duffee[8] and Hull & White[9]. In one paper, Cossin & Hricko[10] have tried to determine which factors affecting the price of the credit derivatives in an empirical way using historical data.

However, there are other methods for improving the efficiency in the credit derivatives market than to create an accurate pricing method. The efficiency can even be seen in a more dynamic way. As far as we know, no papers trying to investigate the efficiency in the credit derivatives market, especially not from the market participant's point of view.

With this background we think it is interesting to find out if the credit derivative market is efficient or not. Since the market is a relatively new financial phenomenon, which has grown rapidly during the last years, one can assume that such a market shows significant

[4] Caouette, J.B., Altman, E.I., Narayanan, P., Managing credit risk, p. 3 (1998).
[5] www.bba.org.uk, 2001-11-28.
[6] Longstaff, F., Schwarz, E., *Valuing credit derivatives*, pp. 6-12, (1995).
[7] Das, S.R., Tufano, P., *Pricing credit sensitive debt when interest rates, credit ratings and credit spreads are stochastic*, pp. 161-198, (1996).
[8] Duffee, G.R., *Estimating the price of default risk*, pp. 197-226, (1999).
[9] Hull, J., White, A., *Valuing credit default swaps I: No counterparty default risk*, (2000).
[10] Cossin, D., Hricko, T., *Exploring for determinants of credit risk in credit default swap transaction data*, (2001).

inefficiencies. However, the market efficiency can be analysed from other points of views than the pricing problem. Therefore we think it would be interesting to find a different approach for investigating efficiency.

Issues that would be interesting to investigate are: Is the market for credit derivatives efficient? Could integration between empirical studies and different academic theories be used to investigate the efficiency?

1.3 Purpose

Using both a theoretical and an empirical perspective, our purpose is to investigate the efficiency in the credit derivative market.

1.4 Limitations

We do not make any statistic quantitative research, based on historical data, about the market efficiency and therefore it is our personal efficiency view that will decide if the market is efficient or not. Also, we do not call the mathematical pricing models of the instruments in question. Only active market participants have been contacted which imply that we can not analyse other interested parties' opinions.

1.5 Disposition

Below the disposition is presented for the following part of the thesis.

Chapter 2 presents the methods we have used in the thesis. The method should help us fulfil our purpose.

In **Chapter 3** we make an introduction to credit risk and describe the credit derivative market.

In **Chapter 4** we present the different academic theories we use in the thesis.

In **Chapter 5** we present our results from the survey.

In **Chapter 6** the material is analysed, by an evaluation of the results from the studies done.

In **Chapter 7** we present those conclusions we have done

2. Methodology

This chapter presents the methods we have used in the thesis. The method should help us fulfil the purpose. We have divided in the chapter in general, choice of topic, selection process and criticism of sources.

2.1 General

The method is the tool that is used to fulfil your purpose. All work that is done to achieve this goal is a method.[11] Below, we describe the method that we have chosen and why this method is the most appropriate to reach our purpose.

First of all we searched for relevant theory and then we studied the theory to get a good ground to stand on for the rest of the thesis. To be able to study the efficiency in the credit derivative market it is necessary to get in touch with market participants. Therefore, we made a qualitative inquiry about the efficiency in the credit derivative market.

We sent the inquiry by e-mail to 23 market participants. These participants were both domestic and foreign protection sellers and buyers. Our first intention was to combine a quantitative regression analysis and a qualitative inquiry. However, since it was impossible to get access to historical data we were forced to drop this. As the work has proceeded, we have got more knowledge about the market and it seems that it was not such a big problem as we first thought, not to get access to historical information about the market. The answers on our inquiry and oral interviews with anonymous market participants told us that a majority of the market actors do not use the electronic marketplaces for trading with credit derivatives. Instead they trade over the counter directly with an investment bank. This means that the prices and bid/ask spreads on the electronic marketplaces are misleading. This is a negotiation process and therefore it is not relevant to measure variables from the electronic marketplaces.

The qualitative method is flexible. Often the data is collected with a direct connection between the investigator and the object that is examined. The idea with the qualitative method is that the object itself partly can influence what is going to be said. However, this does not prevent the investigator to formulate some key questions to steer the object towards a certain direction. This method gives deeper information compared to the quantitative method, which led to a better overview of the relevant questions. The problem is that it can be difficult to compare the information from different investigation objects because the interviews are influenced from different directions. A qualitative method should get a good understanding for a question.[12]

[11] Holme, I.M., Solvang, B.K., *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*, p. 13, (1997).
[12] Ibid, pp. 78-83.

2.2 Choice of topic

The writers' interest in financial markets, especially in risk management, was the main reason for choice of topic. Since we all have studied finance at masters' level at the university we found it logic to write our master thesis in a topic that of course is interesting but also a topic where our knowledge is best. The idea to write a master thesis about the credit derivative market was a decision that grew gradually. Our first intention was to handle a specific instrument on the market, namely the credit default swap. After a while we understood that it would be hard to do something good about just *one* relatively new financial instrument. We wanted to avoid writing a thesis like a descriptive handbook, therefore we were forced to find a more unique approach. Since the credit derivatives market is relatively new and there are just a few studies done, we found it exciting and challenging to study that particular market. The few studies that are done on this certain area handle almost exclusively the pricing problem of credit derivative instruments. This market is a quite new phenomenon and one could assume that the market is not as efficient as it should be. Our final decision was to investigate the efficiency in the credit derivative market. We also believe that the current turbulent economic worldwide environment makes our thesis even more interesting and applicable right now.

2.3 Selection process

When we chose the companies for the qualitative inquiry we looked at a bank survey done by BIS (Bank for International Settlements)[13]. They have listed the main participants of the credit derivative market divided into countries. Our selection procedure was to choose the largest market actors in the biggest European countries including Sweden. The reason for why we selected banks, securities firms and insurance companies is that they stand for almost ninety percent of the market on both the protection seller and buyer side (see figure 3.3). Finally, we ended up with 23 market participants.

2.4 Criticism of sources

The purpose with criticism of sources is to judge the credibility of the primary- and secondary sources. It is only we as writers of the thesis who do this judgement. A part of the Swedish methodology book *Utredningsmetodik för samhällsvetare och ekonomer*[14] illustrates this dilemma. " It is a well known psychological fact that people organises and systematises all those impressions that are constantly registered. This is often done through interpreting the impressions against the background of what you earlier know or think that you know. You only see what you expect to see, want to see, are interested in or what you can benefit from to see. The perception is selective".[15]

[13] BIS, *Public disclosures by banks: results of the 1999 disclosure survey*, (2001).
[14] Lundahl, U., Skärvad, P.H., *Utredningsmetodik för samhällsvetare och ekonomer*, p. 145, (1982).
[15] *Our own free translation*

What we claim to be correct can therefore other people see as incorrect. The method to evaluate the sources has been to view the validity, if the source measures what it says to measure, the relevance, if the source is essential for the question and if the source is free from systematic faults.[16] Of course we only have used material that we think fulfils these criteria's.

While our thesis to a large part is built on an inquiry it is of importance to pay attention to which weaknesses this tool can have. In a qualitative inquiry we want the respondents own apprehensions should appear. Of course we must steer the respondents in a way so we get answers on those questions that are relevant for our investigation. In those on beforehand made frames we encourage to own viewpoints and thoughts. This is done through an inquiry were the respondent are free to make own commentaries after almost every questions.

As always when using this type of questionnaires you get answers that drop out and answers that are not thorough enough to draw conclusions of. In our case we can say that this is not a big problem since we got an answer frequency of over fifty percent and those answers were relatively homogenous. Another problem is that the people that respond to the inquiry do not have knowledge enough to make reliable answers. This problem we solved by sending the inquiry to the top manager of credit department and then we asked him/her to send the inquiry to the person who is best suited to answer our questions. This was successfully because most of the persons that answered have important positions in the companies' credit risk department.

The theories that we use are well known and used by well-established practitioners. In the theory about credit derivative market we refer to academics that got articles published in financial journals. We believe we have used those sources that are best suited for the purpose and that these sources are reliable. The theories we use in chapter four are accepted in the academic world, and therefore we feel comfortable using them.

2.5 Footnotes

When we refer to sources we use footnotes according to the Oxford system.[17] Below we describe how we have worked with footnotes in this thesis.

- Footnote in floating text refers to the word before the footnote.
- Footnote after a sentence refers to the sentence before the footnote.
- Footnote after a section refers to the whole section.
- Footnote after a headline refers to the whole section.

[16] Wiedersheim-Paul, F., Eriksson, L.T., *Att utreda, forska och rapportera*, pp. 82-83, (1991).
[17] Pettersson, G., *Att skriva rapporter*, p. 17, (1997).

3. Credit Risk & Credit Derivatives

In this chapter, we describe the credit derivative market and discuss credit risk in general terms. We also go through pricing, legal issues and present the different instruments.

3.1 Introduction

To understand the mechanisms and to test the efficiency in the credit derivative market we think that the reader must know what credit risk really is and how the market works. We present and define risk in general and describe the credit derivative market. Our ambition in this chapter is not to analyse the market but to describe it. Furthermore, we present an introduction to fundamental pricing theory, both in practice and academically, even though we do not aim to evolve the mathematical pricing issue. We believe some fundamentals in pricing are necessary to understand the completely comprehensive view of the market.

3.2 What is credit risk?

Credit risk is the probability that a borrower will default on a commitment to repay financial obligations. Default occurs when the borrowers do not fulfil their obligations, such as making interest payments to bondholders or repaying bank loans. In the event of default, lenders, bondholders or banks suffer a loss because they will not receive the payments promised to them.[18] Both business cycles and firm specific events influence credit risk. During economic expansions credit risk most often decreases because strong earnings keep default rates low. On the other hand, during economic contractions the credit risk increases because the earnings go down and make it more difficult to repay loans or make bond payments. Firm specific credit risk is unrelated to business cycles. This type of risk arises from actions specific to a firm's business activity or it's industry.[19]

3.3 Measures of credit risk

A common used measure of a firm's credit risk is the credit rating. This type of measure is useful when dividing companies according to their credit risk. Rating firms such as Moody's and Standard & Poors make a credit rating for a company based on a firm's ability to meet scheduled interest and principal payments, its industry competition, and its view for the future. Credit ratings often range from AAA for a firm with the highest credit quality to CCC for a firm likely to default.

Another more quantitative measure of credit risk is the credit risk premium. For fixed income securities, the credit risk premium is the difference between the interest rate a firm pays when it borrows and the interest rate on a default free security for example a Treasury bond. For floating rate securities, the premium is the difference between the interest rate a firm pays

[18] Neal, R.S., Rolph, D.S., *An introduction to credit derivatives*, p. 4, (1999).
[19] Ibid, p. 5.

when it borrows and LIBOR. The premium is the compensation an investor requires for lending to a company that might default. When the firm's credit risk increases, bond investors and banks demand a higher credit risk premium. This increase is necessary to make up for the higher expected losses on the bond or loan from the increased probability that the loan will not be repaid.

3.4 Who is affected by credit risk?

Credit risk affects any party making or receiving a loan or a debt payment for example borrowers, bond investors and commercial banks.[20]

3.4.1 Borrowers

Credit risk affects borrowers because their cost of borrowing depends on their risk of default. A borrower who plans to issue debt faces the risk that unanticipated events increase the costs of borrowing. There are several examples of companies, which got a downgrade in credit rating and therefore increased its cost of borrowing. Even without a change in a company's firm specific credit risk, a downturn in the economy could raise the average credit risk premium and increase the cost of borrowing for all debt issuers.

3.4.2 Bond Investors

Individual bond investors are exposed to the risk of a downgrade in the bond's credit rating. A downgrade will increase the bond's credit risk premium and hence reduce the value of the bond. Similarly, mutual funds that hold a portfolio of corporate bonds will be affected by fluctuations in the average credit risk premium. Increases in the premium reduce the price of the bonds and hurt the fund's total return.

3.4.3 Commercial Banks

Banks are exposed to the risk that borrowers will default on their loans. There are two reasons why the credit risk faced by banks is relatively high. First, banks limits their ability to diversify credit risks across borrowers because of that they tend to concentrate their loans geographically or in particular industries. Second, credit risks is the prevail risk in loans made to businesses. A majority of bank loans have adjustable or floating rates, with the interest rate periodically reset to reflect changes in LIBOR. When the borrower rate reflects changes in LIBOR, movements in LIBOR pose little risk to banks. However, the credit risk return is typically fixed when the loan is made. If the borrower credit rating downgrades, its credit risk premium will rise. Lenders then suffer because the loan payments are inadequate to compensate for the higher risk.[21]

[20] Neal, R.S., Rolph, D.S., *An introduction to credit derivatives*, p. 6, (1999).
[21] Ibid, page 7.

3.5 Pricing credit derivatives

Our ambition is not to investigate different pricing methods in the market, but still, it is important to understand the structure of the pricing process. Below we present a simplification how the price is set, both in a practical and in a historical academic way. Noticeable is nevertheless the fact that there is no well-accepted formula like the Black&Scholes model in the credit derivatives market, so these models can only work as a pedagogic tool to understand the fundamental pricing process of credit derivatives.

3.5.1 Practical Pricing

The compensation an investor receives for assuming a credit risk, which equals the premium that a hedger would need to pay to remove a credit risk, should be linked to the size of the credit risk. The size of the credit risk depends on two factors:

a) The likelihood of default
b) The size of the payoff or loss following default (1-recovery rate)

We assume that the probability for a bond to default over the next year is *p* and the recovery rate if the bond default is *R*. Then we can get a formula for pricing a bond named *P* as follows (where r is the one-year risk-free rate):

$$P = \frac{1}{1+r}\left(p \times 100 \times R + (1-p) \times 100\right)$$

If the one-year probability of default is 0.50%, the recovery rate is assumed to be 40%, and the one-year risk-free rate is 5%, the price of the bond is given by:

$$P = \frac{1}{1{,}05}\left(0{,}005 \times 100 \times 0{,}40 + 0{,}995 \times 100\right) = 94{,}95$$

which is lower than the risk-free zero coupon bond price:

$$P_{risk-free} = \frac{100}{1{,}05} = 95{,}24$$

For the zero coupon bond, we define the credit quality using the spread *s* as follows:

$$P = \frac{100}{(1+r)(1+s)}$$

using the above example, we find that s=30,1 bp

A common used benchmark for probability for default is the credit rating. Moody´s estimates the probability for default dependent on rating and number of years as follows:

	Cumulative Default Probability to Year (%)									
Rating	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Aaa	0	0	0	0.04	0.12	0.21	0.31	0.42	0.54	0.67
Aa	0.02	0.04	0.8	0.2	0.31	0.43	0.55	0.67	0.76	0.83
A	0.01	0.05	0.18	0.31	0.45	0.61	0.78	0.96	1.18	1.43
Baa	0.14	0.44	0.83	1.34	1.82	2.33	2.86	3.39	3.97	4.56
Ba	1.27	3.57	6.11	8.65	11.23	13.5	15.32	17.21	19	20.76
B	6.16	12.9	18.76	23.5	27.92	31.89	35.55	38.69	41.51	44.57

Figure 3.1. Moody´s Cumulative Default Probabilities by Letter Rating from 1-10 years, 1970-2000.

If you assume that the recovery rate is 40% the spread for an Aaa rated company with 5 years maturity according to the above formula should be:

$$\frac{1}{(0{,}0012 \times 0{,}40 + (1 - 0{,}0012))} - 1 = 0{,}000721 = 7{,}21bp$$

And for a Ba rated company with same assumption we get the spread:

$$\frac{1}{(0{,}0182 \times 0{,}40 + (1 - 0{,}0182))} - 1 = 0{,}01104 = 110{,}4bp$$

3.5.2 Sensitivity analysis

To analyse how much each factor influences the price on the credit derivative contract using the above mentions formula we make a sensitivity analysis. As standard values we use rating=A, years=5, recovery rate=40%. The interest rate does not affect the credit spread according to this formula.

	change		
	from	**to**	**price change (%)**
rating	A	Aa	-31.17
	A	Baa	307.81
recovery rate	40%	50%	-16.70
	40%	30%	16.72
maturity	5 years	4 years	-31.17
	5 years	6 years	35.69

Figure 3.2 Sensitivity analysis for pricing

As can be seen in the table above, an upgrade or downgrade of a company affects the price of the credit derivative a lot. Therefore other analyse-tools are needed to get a better price estimate. The most important and widespread tool, which is used to better estimate the price is the KMV-method.

3.6 KMV

KMV is a company that provides several products, which can be used to facilitate the pricing of credit derivatives. KMV's products are based on the Merton Model, which requires financial statement data for each company that KMV tracks. Their software programs provide outputs of expected default rates and default correlations for specific companies, KMV has historical equity prices and a historical database of payment defaults since 1977.[22] EDF credit measures are KMV's proprietary, market-driven measure of default risk. EDF stands for Expected Default Frequency and is the probability that a firm will default within a given time frame. According to KMV there are three main elements that determine the default probability of a firm:[23]

- Value of assets: The *market value* of the firm's assets.
- Asset risk: The *uncertainty* or *risk* of the asset value.
- Leverage: The extent of the firm's contractual liabilities.

KMV claims that the default risk of a firm increases as the value of the assets approaches the book value of the liabilities, until finally the firm defaults when the market value of the assets is insufficient to repay the liabilities. Studies done by KMV have found that the default point, the asset value at which the firm will default, most commonly lies somewhere between total liabilities and current, or short-term, liabilities. So the important net worth of the firm is therefore the market value of the firm's assets minus the firm's default point:

[22] www.kmv.com, 2002-01-01.
[23] Crosbie, P.J., *Using equity price information to measure default riskbook of credit derivatives*, p. 159, (1999).

$$\begin{bmatrix} Market\ Value \\ Assets \end{bmatrix} - \begin{bmatrix} Default \\ Point \end{bmatrix}$$

Thereby, the firm will default when its market net worth reaches zero.

3.7 Academic models

There are two general classes of credit derivative pricing models.[24] The first class of models has its origin from Merton's work in 1974.[25] This model is based on the behaviour of a firm's asset value, which provides the likelihood of a firm's default as a model output. Merton modelled the asset value *V* of a firm as a lognormal process, which requires specification of the expected asset return and asset volatility. In a simple model with one zero coupon bond of face value *F* and maturity *T* in the firm's capital structure:

Equity Payout = Max (V(T)-F,0)

Similarly, the firm's debt can be expressed in terms of a put option on the firm's assets:

Debt Payout = F-Max (F-V(T), 0)

If $V < F$ at maturity, the firm is in default.
There are some problems arising from this model since the firm's asset value and the parameters modelling the behaviour of asset value, are not directly observable in the marketplace. There are also other enormous implementation problems, especially when dealing with risky bonds of firms with complicated capital structures.[26] But even if there are several implementation problems with Merton's model, it is important for practitioners when pricing credit derivatives. A proof of that is the commonly used software program from KMV, who makes pricing models based upon Merton's model.

The second type of modelling is separated from the first by using default rates instead of behaviour of the asset value. These models are more practical and are more commonly used to price credit derivatives. The most famous model within the second type of modelling is the Jarrow-Lando-Turnbull (JLT) model[27]. The JLT-model focuses on modelling default and credit migration in preference to modelling recovery rates. In the JLT-model changes in spreads will be a function of changes in credit rating and the event of default. Another second type model is the Das and Tufano (DT) model[28]. This model is an extension of the JLT-

[24] Hodges, H.M, *Credit Derivatives Pricing Dictionary*, p. 152, (1999).
[25] Merton, R.C., *On the pricing of corporate debt: The risk structure of interest rates*, pp. 449-470, (1974).
[26] Das, S.R., *Pricing Credit derivatives*, p. 135, (1999).
[27] Jarrow, R., Lando, D., Turnbull, S., *A Markov model for the term structure of credit spread*, pp. 481-523, (1997).
[28] Das, S., Tufano, P., *Pricing credit sensitivity debt when interest rates, credit ratings and credit spreads are stochastic*, pp. 161-198, (1996).

model, and uses credit ratings to characterize the probability of default. A further tool concerning the second type of modelling is the analysis developed by Duffie and Singleton[29]. The Duffie-Singleton model allows users of regular term structure models for government bonds to directly apply them to risky debt, by replacing the riskfree rates with risky rates. These models are now known as "reduced-form" models of risky debt pricing.

3.8 Credit derivative market

3.8.1 Growth

Recently a survey by *Risk Magazine* estimated the size of the credit derivatives market at the end of 2000 to be around $810 billion.[30] Another survey from BBA shows estimations that the market will achieve a size close to $ 1.5 trillion by the end of 2001.[31]

3.8.2 Market breadth

There are several types of credits that are actively traded in the market, the credit derivative market includes banks, corporates, high-grade sovereign and emerging market sovereign debt. Estimations recently done shows that corporates accounts for just over 50 % of the market, and the rest 50 % is equally split by banks and sovereign credits.[32]

Risk Magazine have done a geographical survey that shows that 41 % of default swaps are linked to U.S credits, 38 % to European credits, 13 % to Asian, and 8 % to non-Asian emerging markets.[33]

3.8.3 Participants

Counterpart	**Protection Buyer (%)**	**Protection Seller (%)**
Banks	63	47
Securities Firms	18	16
Insurance Companies	7	23
Corporations	6	3
Hedge Funds	3	5
Mutual Funds	1	2
Pension Funds	1	3
Government/Export Credit Agencies	1	1

Figure 3.3 Market shares for buyers and sellers[34]

[29] Duffie, D., Singleton, K., *An econometric model of the term structure of interest rate swap yield*, pp. 1287-1323, (1997).
[30] Risk Magazine, *Credit Risk*, (2001).
[31] www.bba.org.uk, 2001-11-28.
[32] O´Kane, D., *Credit Derivatives Explained*, (2001).
[33] Risk Magazine, *Credit Risk*, (2001).
[34] *British Bankers' Association Credit Derivatives Report 2000*, (2000).

All participants do not compete on the same conditions, since there are different regulations. For example a bank and an insurance company could have different legislation to hold capital against the trading book positions. The same type of legislation is different between countries and this will of course cause benefits for some companies that have a "good" home country. More about legal issues is found later in this chapter.

3.9 The market today

Over the last 24 months the credit derivatives has seen the arrival of electronic trading platforms such as CreditEx, Credittrade and MorganMarkets. These electronic platforms have growth rapidly and they have had a significant impact in improving price discovery and liquidity in the default swap market. The most important players such as the major investment banks and the biggest banks sponsor CreditEx and Credittrade. Morgan Markets is JP Morgan's own marketplace. All registered traders and customers have access to the market places. Today, it is only possible to trade with one single instrument on the markets, namely the default swap. The intention for the future is to expand and manage trading with the other instruments too. If you want to trade with other instruments, you must do this via an intermediary, usually an investment bank.

3.10 Credit derivatives instrument

Below we describe the different credit derivatives instruments. The figure shows the market share of outstanding notional for the different products.

Credit Derivatives Instruments Type	Market Share (% Notional) at end of 1999
Credit Default Products[35]	38%
Portfolio/CLOs	18%
Asset Swaps	12%
Total Return Swaps	11%
Credit Linked Notes	10%
Baskets	6%
Credit Spread products	5%

Figure 3.4 Market Share of Outstanding Notional for Credit Derivative Products[36]

3.10.1 Default Swaps

The most used credit derivative is the default swap and it has become the standard credit derivative. The default swap has attracted the market actors with it's simplicity and because it present many possibilities to the investors that did not previously exist in the cash market. The

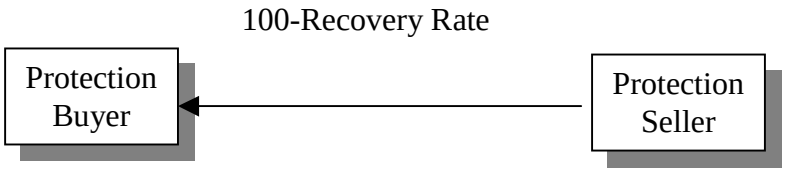
[35] Including credit default swaps
[36] O´Kane, D., *Credit Derivatives Explained*, (2001).

actor who wants to eliminate the credit risk, involved if the issuer default, act as a protection buyer. A swap agreement takes place and the protection buyer swap his risky bond with a risk free treasure bond from the protection seller. The protection buyer makes regular payments to the protection seller. These payments will be larger the higher the risk for default is. Common benchmarks used to value the contract are ratings from the biggest credit-institutes.

With a low rating, the probability for default increases and therefore the price on the contract increases. The risk and the price of the contract even rise with a longer maturity. Expected recovery rate for the issued company even impact the price. If the issued company default, the protection seller gets a share of the debt equal to the recovery rate. Different recovery rates are assumed dependent on historical recovery rates within the specific line of business. So probability to default and maturity of the issued bond are the main factors affecting the price. But the pricing of credit derivatives is more complicated than so. Because the credit derivative market is new and still in a developing stage, some market actors describe the market as the stock option market before the Black-Scholes pricing-model was developed.[37] One bank could sell a credit derivative that has been priced using a model – but this price is often different from the price that another bank with a different model would quote.

Following the credit event one of the following will take place:

Cash Settlement



Physical Settlement

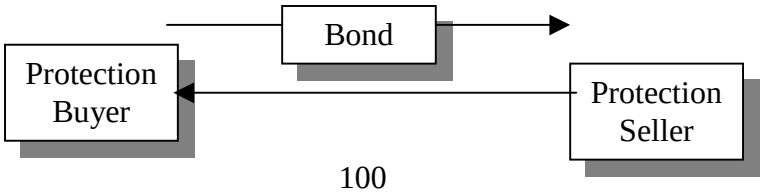


Figure 3.5 Mechanics of a Default Swap[38]

[37] James, J., *How much should they cost?*, (2000).
[38] O´Kane, D., *Credit Derivatives Explained*, p. 25, (2001).

3.10.2 Baskets

The most common credit derivatives basket product is the basket default swap. It is in a way similar to a default swap because the credit event is the default of some combination of the credits in a specific basket of credits. The advantage of the basket default swap is that it allows investors to trade default correlation. The basket consists of a number of companies. The protection seller can have the first-to-default position, which means that he has to make a payment to the protection buyer if one of the companies within the basket defaults. Another protection seller can have the second-to-default position, which means that he has to make a payment to the protection buyer if the second company within the basket default. The premium for protect the first-to-default position is of course higher than having the following positions, since the probability that one of a number of companies will default is higher than two or even more companies will default.

The basket often consists of around five companies. As for the credit default swap the basket spread depends on the credit ratings of the underlying companies and the maturity of the loans. But for the baskets even the number of companies within the basket and the correlation between the different companies default probability matters. It is normal to assume that assets issued by corporations within the same country and industrial sector would have a higher default correlation than those within different countries and industrial sectors. So you have to assume the default correlation, but the basket spread paid is usually 2-3 times the average spread of the assets in the basket for a first-to-default basket on a five reference credits.

3.10.3 Portfolio/CLOs

A CLO (Collateralised Loan Obligation) is a note whose cash flows are linked to the incidence of default in a pool of debt instrument. Often these notes are issued in multiple tranches, based on different credit risk characteristics, varying from AAA to unrated equity, to investors with different investment objectives. The fundamental idea behind a CDO is that one can take a pool of defaultable loans and issue securities whose cash flows are backed by the payments due on the loans. There are three different types of CLOs, arbitrage CLOs, cash flow CLOs and synthetic CLOs. Arbitrage CLOs exploit relative value credit spread opportunities between high-yield subinvestment-grade securities and less risky investment-grade assets. Cash flow CLOs are all about moving credit risk off the balance sheet of a bank for the purpose of regulatory capital reduction. Synthetic CLOs accomplish the same objective as cash flow CLOs, but do so using portfolio default swap technology. If the underlying collateral is made up of debt the instrument instead is called CDO and if the underlying collateral is made up of bonds the instrument is named CBO.

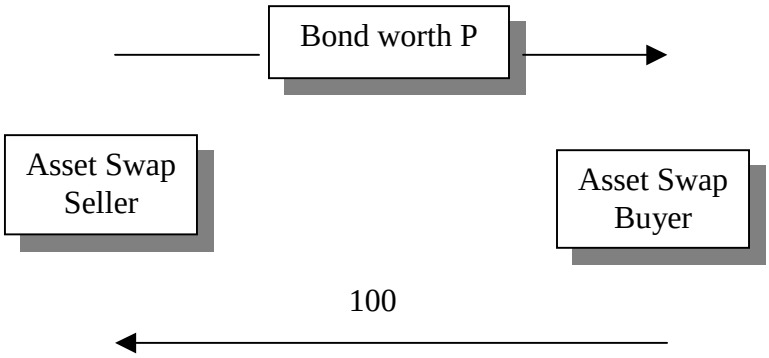
3.10.4 Asset Swaps

The market is most widely used by banks, which use asset swaps to convert their long-term fixed-rate assets, typically balance sheet loans and bonds, to floating rate in order to match their short term liabilities.[39] An asset swap is a synthetic floating-rate note. This means that it is a specially created package that permits an investor to buy a fixed-rate bond and then hedge out the interest rate risk by swapping the fixed payments to floating. The investor takes a credit risk that is the same as buying a floating-rate note issued by the issuer of the fixed-rate bond. For assuming this credit risk, the investor earns matching excess spread called the asset swap spread.

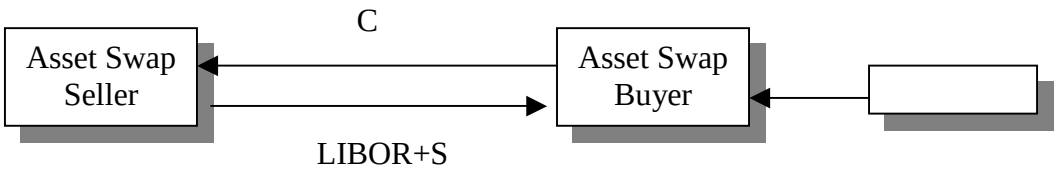
There are several variations on the asset swap structure, but the most common used is the par asset swap. It can be treated as consisting of two separate trades. In return for an up-front payment of par, the asset swap buyer:
Receives a fixed rate bond from the seller. Usually the bond is trading away from par.
Enters into an interest rate swap to pay to the seller a fixed coupon equal to that of the asset. In return, the asset swap buyer receives regular floating rate payments of LIBOR plus (or minus) an agreed fixed spread. The maturity of this swap is the same as the maturity of the asset.
A very important thing to understand an asset swap is that the asset swap buyer takes on the credit risk of the bond. If the bond defaults, the asset swap buyer has to continue paying the fixed side on the interest rate swap that not can be funded with the coupons from the bond.
We classify the asset swap within credit derivatives, which also is claimed by O´Kane[40]. However, it could be argued if the asset swap should be classified as a plain vanilla swap contract or within credit derivatives.

[39] O´Kane, D., *Credit Derivatives Explained*, p. 19, (2001).
[40] Ibid

An initiation Asset Swap buyer purchases bond worth full price P in return for par



And enters into an interest rate swap paying a fixed coupon of C in return for LIBOR plus asset swap spread S



If default occurs the asset swap buyer loses the coupon and principal deliverance on the bond. The interest rate swap will continue until bond maturity or can be closed out a market value.

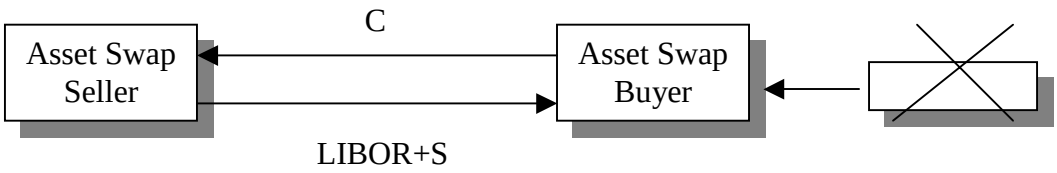


Figure 3.6 Mechanics of a par Asset Swap[41]

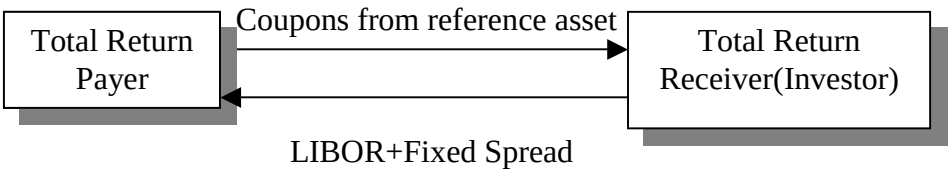
3.10.5 Total Return Swaps

A total return swap is a contract that permits investors to receive all of the cash flow benefits of owning an asset without actually the physical asset on their balance sheet.[42] This means that a total return swap is more a tool for balance sheet arbitrage than a credit derivative. Thus, as a derivative contract with a credit dimension, the asset can default. Usually it falls within the responsibility of the credit derivatives trading desk of investment banks and therefore becomes classified as a credit derivative. This instrument however may be of interest for investors of two reasons. First, the total return swap makes it possible to short an asset without selling it. This is useful when temporarily hedging the risk of the credit, deferring a payment of capital gains tax, or simply gaining confidentially regarding

[41] O´Kane, D., *Credit Derivatives Explained*, p. 20, (2001).
[42] Ibid, p. 42.

investment decisions. Second, you can use the total return swaps to create a new synthetic asset with the required maturity. Credit maturity gaps in a portfolio may, therefore, be filled.

During Swap



At maturity

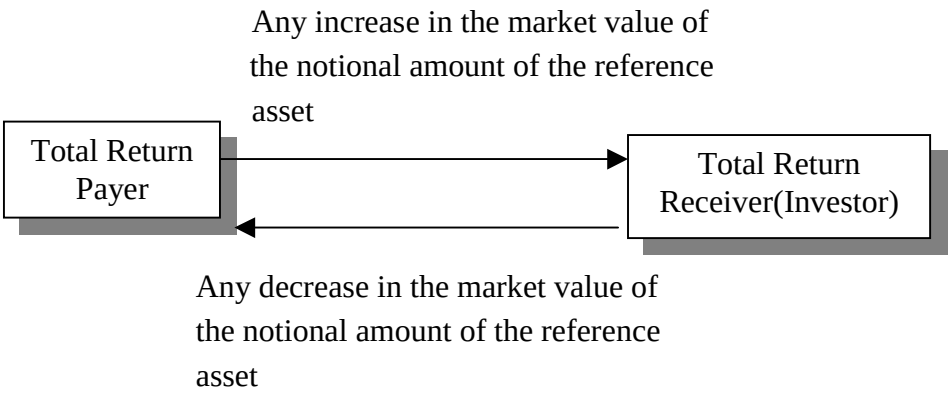


Figure 3.7 Mechanics of a Total Return Swap[43]

3.10.6 Credit Linked Notes

For investors who want to take exposure to the credit derivatives market and who require a cash instrument, one possibility is to buy it in a funded credit linked note form. The instrument is a security issued by a corporate entity (bank or otherwise) agreed upon by the investor and an investment bank. The note pays a fixed- or floating-rate coupon and has an embedded credit derivative. If the note issuer defaults, then the investors can lose some or all of their coupon and principal. A credit-linked note contains an embedded default swap. The investors pays par to buy the note, which then pays LIBOR plus a spread equal to the default swap spread of the reference asset plus a spread linked to the funding spread of the issuer. Similarly to an asset swap, the credit-linked note is a synthetic par floater. If the reference asset defaults, the credit-linked note accelerates, and the investor is delivered the defaulted asset.

[43] O´Kane, D., *Credit Derivatives Explained*, p. 43, (2001).

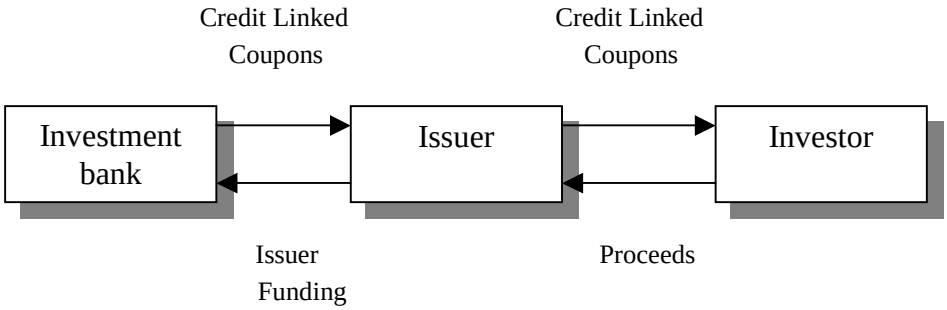


Figure 3.8 Structure of a Credit Linked Note[44]

3.11 Legal and regulatory issues

Even if credit derivatives are hybrids of traditional credit products and derivative instruments they do not always fit into the existing regulatory and supervisory frameworks.

It is of great importance how authorities change legal and regulatory issues that could dramatically change the rules of the game. Since it is in all participants' interest to get a more clear regulation, the new regulatory capital framework for banks is welcomed. The Basel Committee on Banking Supervision is currently working on a major revision of the 1988 Capital Accord. During the last decade the structure of financial markets has transformed dramatically and there is an obvious need for the market to get a standard documentation and clear definitions. The International Swaps and Derivatives Association (ISDA) have introduced new definitions within the framework of the ISDA Master Agreement. They have tried to eliminate legal basis risk and to standardise the default swap documentation. The legal basis risk is defined as the risk that a derivative contract may be deemed illegal, unsuitable or non-binding.[45]

3.11.1 Legal Documentation[46]

The settlement process

When a credit event has occurred, one or both parties to the default swap deal must send a Credit event notice to the other. This can be sent up to 14 calendar days after the scheduled termination of the default swap, provided that the credit event happened prior to the scheduled termination date.

If the credit event happens just before the scheduled termination date (maturity) then this can be 14 days after the grace period extension period if a grace period is applicable. If a bond fails to pay a coupon, it is not technically a failure to pay until a grace period is up during

[44] O´Kane, D., *Credit Derivatives Explained*, p. 34, (2001).
[45] Kaplan, J., Rolph, D.S., C*redit Derivatives Glossary*, p. 380, (1999).
[46] O´Kane, D., *Credit Derivatives Explained*, pp. 61-67, (2001).

which no coupon payment is made. This grace period is typically 30 days. A grace period extension prolongs the life of the transaction to enable the protection buyer to confirm whether a failure to pay has really occurred. A credit event must be public in specified news sources. What happens next depends on whether the default swap is to be cash or physical settled. Below we present the different types of credit events.

Credit Event	**Description**
Bankruptcy	Corporate becomes insolvent or is unable to pay its debts. The bankruptcy event is, of course not relevant for sovereign issuers.
Failure to Pay	Failure of the reference entity to make due payments greater than the specified payment requirement (typically $ 1 million), taking into account some grace period to prevent accidental triggering due to administrative error. A grace period may be specified, which may extend the maturity of the default swap if there is a potential failure to pay.
Obligation Acceleration/ Obligation Default	Obligations have become due and payable earlier than they would have been due to default or similar condition, or obligations have become capable of being defined due and payable earlier than they would have been due to default or similar condition. This latter alternative is the more encompassing definition and so is preferred by the protection buyer. The aggregate amount of obligations must be greater than the default requirement (typically $ 10 million).
Repudiation/Moratorium	A reference entity or government authority rejects or challenges the validity of the obligations.
Restructuring	Changes in the debt obligations of the reference creditor but excluding those that are not associated with credit deterioration, such as renegotiations of more favourable terms.

Figure 3.9 List of ISDA Specified Credit Events with descriptions[47]

Cash Settlement

The most important issue in the cash settlement process is to establish the final price of the reference obligation. Most common, a single valuation date is used at a certain time. The price used is the bid. The definitions require the calculation agent to obtain quotations from five dealers and using the highest or averaging them after discarding the highest and lowest, that obtains the final price. A weighted average can be used as valuation tool if two or more of the dealers are unable to quote. As many quotes from as many dealers as possible are obtained that aggregate to the total notional amount, with each quotation size exceeding $ 1 million. If there is no quotation obtained from the calculation agent within 13 days of the original

[47] O´Kane, D., *Credit Derivatives Explained*, p. 62, (2001).

valuation date and the parties cannot obtain quotations within further five days, then the quotation is zero.

Cash settlement is then made three days after the final price have been set.

Physical Settlement

After the notification of the credit event, the protection buyer must determine what obligations will be delivered and send a Notice of Intended Physical Settlement to the protection seller. Normally, then the obligations will be delivered within the standard settlement period, on T+3, i.e. three days after notification was given.

The amount of deliverable obligations delivered will be a principal amount to the notional amount of the trade.

If the protection buyer fails to deliver the bonds within five business days after the original physical settlement date, then the default swap terminates without payment from the seller. The only exception to this is in the case that the failure to deliver the defaulted assets was due to an impossibility or illegality. A lack of liquidity is not an excuse. If impossibility or illegality prevents delivery for 30 days after the original physical settlement date, then the definitions allow for cash settlement based on the final price of the obligations that could not be delivered.

3.11.2 Bank regulatory capital treatment

Bank regulatory capital treatment is the supervisory issue that probably has drawn most attention from the market participants since the beginning of the market. Most banks are required by legislation to hold capital against risk exposures. There are two principal types of credit risk; the first type is the banking book exposures arising from traditional lending activities and the other type is the counterpart credit risk arising from OTC derivative activities.[48] The purpose of this legislation is of course to ensure that the banking sector is sufficiently capitalised against unexpected losses.

The regulatory capital framework for banks was first established by the "July 1988 Basel Capital Accord" produced by the Basel Committee on Banking supervision. This regulation is still valid for banks worldwide but since there are a lot of weaknesses in this regulation, BIS is currently working on a new regulatory framework. One of the problems with the current legislation is the rule of risk weights.

[48] Staehle, D., *The Supervision of credit derivative activities of banking organizations*, p. 303, (1999).

Below we show a table with the current risk weights.

Type of Reference Entity	BIS Risk Weight	Charge as % of Notional
OECD Government	0%	0.0%
OECD Bank	20%	1.6%
Other	100%	8.0%

Figure 3.10 The BIS Risk Weights

The risk weightings are determined according to the type of reference entity and are then multiplied by 8% to determine the percentage of notional that contributes to the overall capital charge. These rules were established long before the credit derivative market developed so when using credit derivatives this can lead to quite unrealistic and static valuations of different risks. For example, both Turkey and the US are OECD members whose government debt is 0% risk-weighted. But Turkey is viewed as a much riskier credit, with bond yields with hundreds of basis points higher than the equivalent US Treasury bond. Another weakness of the current legislation is that all corporate debt, without consideration of credit quality has a 100% risk weight.

Market participants welcome the new regulatory framework since there is an obvious need for a more dynamic framework; this is also pointed out by academics like Myron Scholes.[49] The new framework, Basel 2, is to be published around the end of 2001 and to be implemented in 2004.[50] In the table below the new risk weights are shown, these new risk weights are linked to external credit ratings.

	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Sovereigns	0%	20%	50%	100%	150%	100%
Banks Option 1[1]	20%	50%	100%	100%	150%	100%
Banks Option 2[2]	20%	50%	50%	100%	150%	50%
Corporates	20%	50%	100%	150%	150%	100%

Figure 3.11 Proposed Basel 2 Standardised Approach Risk Weights by Claim Type and Rating

1- Risk weighting based on risk weighting of sovereign in which bank is incorporated

2- Risk weighting based on assessment of the individual bank

Option 1 or 2 is to be chosen by the national regulator.

There are several problems when using external rating as tool. The main problem is that far fewer issuers are rated outside the U.S than within. Another problem is that ratings are not an

[49] Scholes, M., Seminar, Lund, Sweden 2001-12-06.

absolute measure of credit risk; in some cases the country's rating will stop a company from having for example AAA. This problem has been one of the reasons why the Basel committee has considered an internal ratings approach.

Banks that satisfy certain requirements will be allowed to use an Internal Ratings Based (IRB) approach that will allow the bank to use its own internal ratings methodology.[51] This approach is believed to result in a reduction in overall regulatory capital. The IRB approach itself split into two: a groundwork approach and an advanced approach. The advanced approach gives the bank more discretion in its modelling assumptions. However, the hurdle in terms of systems and model requirements is higher.

3.11.3 Accounting for Derivatives

During the last years international associations for accounting have tried to develop better rules for reporting derivatives exposures. Since there have been a substantial growth in the usage of derivatives in general, and the old rules are no longer applicable for today's financial world, this has been a highly priority issue.

In the U.S, the Financial Accounting Standards Board (FASB) has issued Financial Accounting Standard 133, entitled *Accounting for derivative financial instruments and hedging activities*. This new standard, known as FAS 133, applies to companies using Generally Accepted Accounting Principles (GAAP). This is the classical U.S standard method for accounting.

In response the European association, International Accounting Standards Committee (IASC), has produced International Accounting Standard 39 (IAS 39), which applies to companies using the IAS standard.

3.12 Summary of Credit Risk

When we summarize the above chapter we can clearly see that the market for credit risk, and especially credit derivatives market, is very complex. Therefore we believe it is interesting to apply different theories upon the credit derivatives market. In the next chapter, we will present these different academic theories.

[50] www.bis.org, 2001-12-07.
[51] BIS, *The Internal Ratings-based approach, Consultative document*, (2001).

4. Theory

First we give a background to the choice of theory. Then we present the four different academic efficiency theories we use in the thesis.

4.1 Choice of theory

It is common to use Fama's efficient market hypothesis (EMH)[52] when measuring efficiency in different financial markets. That hypothesis is excellent and simple to understand, but to only use EMH as an efficiency measurement on a new market is according to us not enough. We add three other efficiency theories in purpose to link these theories together ending up with a more comprehensive approach. The diverse theories all can be used to determine efficiency. The difference between them is that they see efficiency in different ways and hence they measure different forms of efficiency. We see the theories as complements for each other rather than opposites.

According to Walter you get a dynamic efficient market through product innovations and process innovations. Product innovations usually involve creation of new financial instruments along with the ability to replicate certain instruments by bundling existing ones (synthetic securities) or to highlight a new financial attribute by bundling existing instruments. Process innovations include contract design, methods of settlement and trading, techniques for efficient margin calculation, new approaches to contract pricing, passive or index-based portfolio investment techniques, and a range of others.[53]

The theories that we use are:

- **Financial innovations**, because the credit derivative market is a relatively new market, and the securities used are mostly new innovations, it is relevant to discuss what driving forces that cause financial innovations and how this is illustrated in the credit derivative market. Financial innovations in itself could be considered as an expression to the dynamic growth.
- **Efficient Market Hypothesis,** furthermore to analyse the pricing process and to measure the efficiency in the market, there are different theories. We believe that to catch up both the static and dynamics in a market, it would be too simple just using one theory. Therefore we use EMH as the classical efficiency theory, which focus on how information impacts the pricing process.
- **Market microstructure theory,** is less known and not that common used as EMH. Market microstructure captures another aspect on the pricing process. The theory focus on what causes the desire for demanders and suppliers so a price emerges and trade occurs.
- **Asymmetric information,** We believe that one important issue is to investigate how the information flow is distributed and whether the market information is asymmetric or not.

[52] Fama, E.F., *Efficient capital markets: A review of theory and empirical work*, pp. 383-417 (1970).
[53] Walter, I., *Understanding the structure and dynamics of global financial flows*, pp. 614-615, (1997).

Here we write about adverse selection and moral hazard and how those phenomena can be implemented in the credit derivative market.

4.2 Financial innovations

Oxelheim writes that financial markets are characterised by actors constantly willing to find new ways to earn money. These possibilities are created through distributed information, tax wedges, inefficiencies in the market or inefficiencies created by authorities. Oxelheim states that these profit possibilities make us develop financial and organisational innovations.[54]

Parkin, Powell and Matthews argue that the economic environment, technology and regulations as the most important influences behind financial innovations. Historically a high degree of the innovations occurred in the 1970 and 1980 thanks to high inflation rates and high interest rates, which gave new possibilities to lend money to a floating interest rate. Technological changes are another main issue creating financial innovations. Lower costs for data processing and communication made it possible to create automatic withdrawal machines and credit cards. Financial innovations have even occurred as regards efforts to circumvent regulations.[55]

Berg and Näslund establish similar driving forces. They write that financial innovations in the United States have been created though technological improvements, high inflation rates, volatile interest rates and regulations. A high-developed information technology has helped to augmenting the availability of financial innovations and decreases the costs for delivery and transaction costs.[56] Important driving forces, argued by Oxelheim[57], are improvements in information technology and increase in economic integration.

A vital role is to educate current and future customers, and it is there the companies lay their marketing efforts. Typical actions are introduction packages, invitations, information meetings and follow-ups with present and potential customers financial departments. The Swedish market has strength due to many pioneers willing to test new products. Sweden has a well-developed technological progress, which has played a vital role when it comes to innovate financial instruments.[58]

Financial innovations can be seen as the force driving the global financial system towards its goal of greater economic efficiency. In particular innovations involving derivatives can improve efficiency by expanding opportunities for risk sharing, by lowering transaction costs and by reducing asymmetric information and agency costs.[59]

[54] Oxelheim, L., *Financial markets in transition*, (1996).
[55] Parkin, M., Powell, M., Matthews, K., *Economics*, (1997).
[56] Berg, L., Näslund, B., *Finansiella innovationer*, (1998).
[57] Oxelheim, L., *Financial markets in transition*, p. 27, (1996).
[58] Berg, L., Näslund, B., *Finansiella innovationer*, (1998).
[59] Merton, R.C., *Financial innovation and the management and regulations of financial institutions*, (1995).

Different financial innovations are important to get the financial markets dynamic efficient. All derivatives are financial products that have been created trying to make the financial markets more dynamic. Debates about if financial innovations in form of new instruments like options, futures and swaps create social benefits that outweigh the cost or not have been common.[60]

According to Merton innovations in financial products and services can improve economic performance in three basic ways: [61]

- By meeting investor or issuer demands to "complete the markets" with new securities or products that offer expanded opportunities for risk-sharing, risk-pooling, hedging, and intertemporal or spatial transfers of resources;
- By lowering transactions costs or increasing liquidity;
- By reducing "agency costs" that arise from either "information asymmetries" between trading parties of principals incomplete monitoring of their agents performance.

Finnerty has done another classification. According to him innovative debt securities, like credit derivatives, can add value in the following ways: [62]

- By reallocating some form of risk from issuers or investors to other market participants more willing to bear them;
- By increasing liquidity – that is, the ability of investors to sell without lowering the price or incurring high transactions costs;
- By reducing the "agency costs" that arise from conflicts of interest among management, shareholders and creditors;
- By reducing issuers underwriting fees and other transaction costs;
- By reducing the combined taxes of issuers and investors;
- By circumventing regulatory restrictions or other constraints on investors or issuers.

4.3 Efficient market hypothesis, -EMH

An issue that is the subject of intense debate among academics and financial professionals is the Efficient Market Hypothesis (EMH). The Efficient Market Hypothesis states that at any given time, security prices fully reflect all available information. The implications of the efficient market hypothesis are truly deep. Most individuals that buy and sell securities do so under the assumption that the securities they are buying are worth more than the price that they are paying, while securities that they are selling are worth less than the selling price. But if markets are efficient and current prices fully reflect all information, then buying and selling securities in an attempt to outperform the market, will effectively be a game of chance rather than skill.

[60] Miller, M.H., *Financial innovation: Achievements and Prospects*, pp. 4-11, (1992).
[61] Merton, R.C., *Financial innovation and economic performance*, pp. 12-22, (1992).

"An efficient market is defined as a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value."[63]

It is common to separate among three versions of the EMH: the weak, the semistrong, and the strong forms of the hypothesis. The different versions differ according to what is meant by the term all available information.

- **The weak form** states that stock prices already reflect all information that can be derived by examining market trading data, for example the history of past prices, trading volume or short interest. This says that analysing trends is fruitless. Historical stock price data are publicly available and almost costless to obtain. The weak form hypothesis states that if such data ever expressed reliable signals about future performance, all investors would have learned long since to use the signals.
- **The semistrong form** asserts that all publicly available information regarding the prospects of a firm already must be reflected in the stock price. The information includes, besides past prices fundamental data of a firm. Similarly to weak form, if any investor has access to this information from publicly available sources, one would expect it to be reflected in stock prices.
- **The strong form** states that current prices fully reflect all public and private information. This means that you should not be able to make abnormal returns even if you trading on insider information.

4.4 Market microstructure theory

Market microstructure is the study of the process and outcomes of exchanging assets under explicit trading rules.[64] Market microstructure theory focuses on how the equilibrium prices are made in practice in opposite to the classical economic pricing theory, which focuses on mathematical explanations on prices.

The classical expression that it is the intersection of supply and demand that determines a price, of course this is the case in equilibrium, but an interesting question is what causes the desire for demanders and suppliers so a price emerges and trade occurs. This question has few answers and that is the origin to the market microstructure research. The early work of the

[62] Finnerty, J.D., *An Overview of corporate securities innovation*, pp. 23-39, (1992).
[63] Fama, E.F., *Random walks in stock market prices*, (1965).
[64] O'Hara, M., *Market Microstructure Theory*, p. 1, (1997).

theory investigated issues relating to the stochastic nature of supply and demand, later work focuses more on the information-aggregate properties of prices and markets.

Market microstructure research exploits the structure provided by the specific trading mechanisms to model how price-setting rules evolve in markets. Market microstructure research is useful for enlightening the behaviour of prices and markets.

There are two traditional approaches to the mechanics of price formation.[65] The first states that, all actors receive the new information at the same time, after that the prices will be adjusted to the level where the new information is reflected. Since market participants need to adjust their portfolios trading volume will increase.

The second approach relies on that some actors have more information than others. New information is only gradually distributed and when the informed traders are acting in the market, their trading will reveal the information and equilibrium prices will occur.

In both cases the information will result in higher trading volume. The difference between the approaches is that in the first everyone has the same information meanwhile the second approach is based on asymmetric information. In the first approach the market is totally information efficient but not in the second approach since prices not continuously reflects all information.

4.4.1 Liquidity

Liquidity is typically defined as the ability to convert an asset into an amount of cash equal to its current market value. Still liquidity is hard to define, this problem is expressed by O'Hara like "Because liquidity, like pornography, is easily recognized but not so easily defined"[66] and this comparison shows how hard liquidity is to define. Harris uses *immediacy*, *width*, *depth* and *resiliency* to define different parts of liquidity:[67]

- *Immediacy* means how fast a market actor could execute its trading decisions and find a counterpart, i.e. from decision to settlement.
- The market's *width* measure the cost of first buying the smallest possible quantity and then sell the same quantity. In principle this is the bid-ask spread. Sometimes transaction costs is included.
- The *depth* in a market describes how much an actor can buy or sell without changing the price.
- *Resiliency* describes how fast the market will find a new equilibrium after a temporary liquidity chock.

[65] O'Hara, M., *Market Microstructure Theory*, p. 3, (1997).
[66] Ibid, p. 215.
[67] Harris, L., *Minimum price variations, discrete bid/ask spreads, and quotation size*, pp. 149-178, (1994).

A liquid market should have high immediacy, low width, big depth and high resiliency. Such a market is welcomed since it supports the information efficiency. On a illiquid market, prices will seldom reflect all relevant information since pricing process will be worse. Thereby the information that price normally distributes to other market participants will be reduced and the information efficiency will decrease.[68]

4.4.2 Volatility[69]

The doubt of the market value on a financial derivative often states as the volatility. Volatility is normally measured as the variance in the yield. There are two different ways of doing that, most often you use historical yields and estimate the historical volatility as an approximation of the future volatility. One problem with this measurement is that you have to define the yields during a certain time period, additionally you need many observations, for example daily data transactions. Thereby most volatility estimations will be approximations of the historical volatility, which hopefully is a good, benchmark for what you wants to measure, namely the future volatility.

Another way of measure the volatility is to use the Black-Scholes model and backwards calculate what volatility is implied in the observed prices. One problem with this measurement is that you have to rely totally to the model, which not always is not the right thing to do.

You could say that only volatility that is based on fundamental factors should be reflected in prices, meanwhile trade based volatility is per definition bad. Nevertheless, this is not always the case, in a short perspective some volatility is necessary. Additionally some short-term volatility will attract speculators since that increase their chances of doing profits. This lead to an increase in liquidity in the market since these participants works as oil in the machinery. If there are no volatility what so ever, there are no possibilities to do short speculations, and that will affect the liquidity. That means that most market structures are dependant in some volatility to remain the liquidity in the market. Generally you can assume that to have some market participants acting as market makers, there must be some minimal order flow with different market actors who wants to buy and sell.

4.4.3 Market Transparency

Market transparency refers to the ability of market participants to observe the information in the trading process. That definition seems simple, but still there are a lot of complex problems when defining transparency. A market is said to be transparent if the order flow can be observed, but within that definition there are two different problems; first question is the order flows character i.e. direction, timing, size and form, second question is who can observe the

[68] Niemeyer, J., *Värdepappershandel i Sverige*, (2000).
[69] Ibid.

information. Seemingly there could be transparency problems both outside as well as inside the actual market. [70] The markets form is also of importance, there are obvious differences between a market platform based on computers and a classic OTC-market.

There is also another aspect of transparency, which is the information about for example companies' future financial situation. It is an important issue for the market to have some type of demands on companies to deliver accurate information to all market participants. It is a very important issue to get confidence from the public as well as from market participants. The issue that all participants do not have the same information leads to theories about asymmetric information.

4.5 Asymmetric information

Most of the economic literatures do not examine the problems raised by differences in information. By assumption, buyers and sellers are both perfectly informed about the quality of the goods being sold in the market. This assumption holds if it is easy and not costly to verify the quality of a product. But if the information about the quality is costly to obtain, then it is no longer probable that buyers and sellers have the same information about goods involved in transactions. There are certainly several markets in the real world where it may be very costly or even impossible to get accurate information about the quality of the goods being sold.

The most famous example of asymmetric information is the Nobel Prize winner 2001 George Akerlof's paper from 1970 about "The Market for Lemons".[71] This paper is a model of the market for used cars. Consider a market with 100 people who want to sell their used car and 100 people who want to buy a used car. Everyone knows that 50 of the cars are "lemons" (a bad car) and 50 are "plums" (a good car). Of course the current owner of the car knows its quality, but the potential buyers do not know whether any car is a plum or a lemon. The owner of a lemon is willing to sell the car for $1000 and the owner of a plum is willing to sell for $2000. The buyers are willing to pay $1200 for a lemon and $2400 for a plum. What happens to the market if the buyers can not observe the quality of the car? Assume that if a car is equally likely to be a lemon as a plum, then a typical buyer would be willing to pay the expected value of the car. Using the figures above this is (1/2*1200)+(1/2*2400)=1800. In this case no one of the owners of plums is willing to sell their cars because they need at least $2000. At the price of $1800 only lemons would be offered for sale. But if the buyer knows that he get a lemon he would not be willing to pay $1800 for it. In fact, the equilibrium price in this market would have to be somewhere between $1000 and $1200. For a price like this only owners of lemons would offer their cars for sale and none of the plums ever get sold.

[70] O'Hara, M., *Market Microstructure Theory*, p. 252, (1997).
[71] Akerlof, G., *The market for Lemons: Quality Uncertainty and the market mechanism*, pp. 488-500 (1970).

The problem is that there is an externality between the sellers of good cars and bad cars. When a person decides to sell a bad car, he affects the buyers' perceptions of the quality of the average car on the market. This lowers the price that they are willing to pay for the average car, and thus hurts the people who are trying to sell the good cars. This externality creates a market failure.

4.5.1 Adverse Selection

The phenomenon where one goods or service crowding out another goods or service because of the high cost and difficulty of acquiring information is called adverse selection.[72] To simplify the description we use an example from the insurance industry.

An insurance company wants to offer insurance for bicycle theft. In some areas the probability is high that a bicycle will be stolen and in other areas there is a low probability. Suppose that the insurance company offers the insurance based on the average theft rate. If this is the case the insurance company is likely to be bankrupt quickly because only people in the area with lot of thefts will buy the insurance at the average rate. This in turn lead to only people in the high-risk areas will use the insurance. A premium based on the average probability of theft will be a misleading indication of the actual rates of people who will get money out of their insurance. The insurance company will not get an unbiased selection of customers; they get an adverse selection.

4.5.2 Moral Hazard

Another problem from the insurance company is known as the moral hazard problem. Consider the bicycle theft area again and suppose that all of the customers live in areas with identical probabilities of theft, so there is no problem of adverse selection. On the other hand the probability of theft may be affected by the actions taken by the bicycles owners. If the bicycle owners do not lock their bikes or use bad locks, the bicycle is more likely to be stolen than if they use a secure lock. If it were impossible to buy bicycle-theft insurance all owners would lock their bikes with expensive locks because they must pay for a new bike when it get stolen. But if it is possible to buy insurance then the cost inflicted on the person of having his bicycle stolen is much less. In the extreme case, where the insurance company completely compensate people for the theft of his bicycle, there is no longer an incentive to take care of the bike at all. This lack of incentive to take care is called moral hazard.

When it is possible to observe the amount of care, then there is no problem because the insurance company bases its rates on the amount of care taken. Insurance companies can not observe all relevant actions of those they insure. Therefore there is a trade-off involved: too

[72] Varian, Hal R. (1999) *Intermediate microeconomics, -A modern approach*, p. 645, (1999).

little insurance means that people bear a lot of risk, too much insurance means that people will not take care at all.[73]

Zhou and Duffee[74] find that the value of the credit derivatives market critically depends on whether the asymmetric information associated with bank loans primarily is an adverse selection problem or a moral hazard problem. For example, if the quality of a bank's loan portfolio is entirely exogenous (the bank does the best job it can of lending money, but sometimes its pool of potential borrowers is weak), a breakdown in the loan-sales market caused by the introduction of credit derivatives would be socially costly.

At the other extreme, if the portfolio's quality is entirely endogenous (potential borrowers are homogenous, and the bank can spend money to monitor its loans aggressively). The loss in risk sharing owing to a breakdown in the loan-sales market would be offset by a reduction in moral hazard problem, and hence the introduction of credit derivatives market would be beneficial.

4.6 Summary of theory

When reading the above chapter, you can see that academic theories could add much to the understanding of the mechanics in a market. Still, we need a more practical view from the credit derivative market and therefore it is important to get opinions from market participants. This in purpose to be able to see through the more descriptive and academically view and to realize how the market really works and what the participant's apprehensions is. In the next chapter, we will present answers from our inquiry, which we believe gives an extension to the understanding of the credit derivatives market.

[73] Ibid, p. 647.
[74] Duffee, R.G., Zhou, C., *Credit derivatives in banking – Useful tools for loan risk management?*, (2001)

5. Empirical study

In this chapter, we present our empirical study in an objective way, without no own reflections and thoughts. The empirical study consists of one inquiry.

We sent our inquiry to 23 market participants and got 12 answers. Since all companies are financial institutions there are no adequate relevance for specify different answers, for different type of companies. Additionally we also promised confidentiality to the participants. The whole inquiry sent to the participants can be seen in appendix 1.

We sent our inquiry to the following market participants:

ABN Amro	Lehman Brothers
Barclays	Merrill Lynch
BNP Paribas	Morgan Stanley
Credit Agricole	Nordea
Credit Suisse	Royal Bank of Scotland
Deutsche Bank	SEB
Dresdner Bank	Sirius International
Föreningssparbanken	Societé Generale
Goldman Sachs	Solomon Citigroup
Handelsbanken	Swiss Re
Hypo Vereinsbank	UBS Warburg
JP Morgan	

Figure 5.1 The companies that got our inquiry

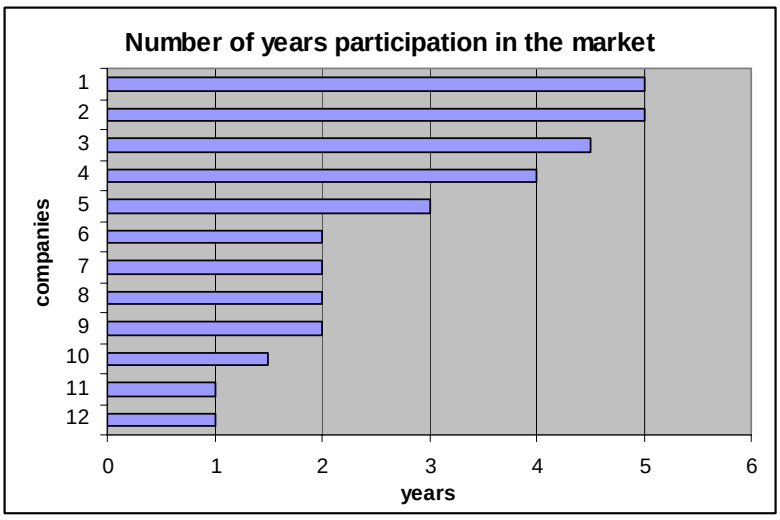
5.1 Inquiry results

When we present the answers from the inquiry in this chapter, we have put questions, which are related to each other in the same sector of answers. At first we present questions of general character, next section shows answers from different efficiency questions, and finally we account for market participants opinions and future visions.

5.1.1 General questions

Does your company use credit derivatives?
All of the respondents answered that they use credit derivatives.

How long have you traded on the credit derivatives market?
The respondents had traded in the credit derivatives market for one up to five years. The schedule for all twelve actors follows in the table and diagram below.



Years	Companies
1	2
1,5	1
2	4
3	1
4	1
4,5	1
5	2
Total	**12**

Figure 5.2 Number of years participation in the market in diagram and table.

How has the market developed during the time you have been a participant?

Everyone answered that the market volume and the number of participants have increased significantly. One actor said: "Increasing supply and demand. The market has become increasingly competitive, and more equity driven, i.e. increasing price correlation between the prices on the equity and credit markets".

How do you trade?

All the respondents answered that they trade Direct against Investment bank connections. Five of these said that they even act as a market maker. Another respondent said that they used Morgan Markets, but only for information-purposes – all the trading was made Direct against Investment bank connections.

Which instruments do you use, and by percentage in each instrument?

The table bellow shows, which instruments the 12 respondent companies trade. All trade Credit Default Products, which even have the highest trading volumes with 44%. The other products are less both in number of companies using them and percentage trade.

Instrument	Number of companies trading the product	Percentage of trading-volym
Credit Default Products	12	44%
Portfolio/CLOs	6	6%
Asset Swaps	9	15%
Total return Swaps	3	9%
Credit Linked Notes	6	15%
Baskets	6	5%
Credit Spread Products	5	6%

Figure 5.3 Share of outstanding notional for credit derivative products for respondents.

The distribution of percentage trade in the different instruments is rather similar to the distribution presented in chapter 3 valid for the whole market. This indicates that the companies participating in our survey could be a good sample for the whole population.

Do you act as a protection seller, buyer or both?
Eleven out of twelve respondents answered that they act both as protection seller and buyer. One actor said that they only act as a protection seller.

How much notional value, in USD, do you trade during a year, which include % as protection seller and % as protection buyer?
Two respondents did not want to answer this question due to confidentiality. The actors who answered gave the following reply (see table below):

Company	mln USD	seller	buyer
1	5000	45%	55%
2	3000	40%	60%
3	2000	50%	50%
4	1000	55%	45%
5	1000	40%	60%
6	800	100%	0%
7	600	50%	50%
8	500	25%	75%
9	100	50%	50%
10	60	95%	5%
Totally	**14060**	**48%**	**52%**

Figure 5.4 The actor´s trading volumes and distribution between protection seller and buyer.

Of the total notational value 48% is traded as protection seller and 52% as protection buyer. The distribution between protection seller and buyer is therefore rather equable.

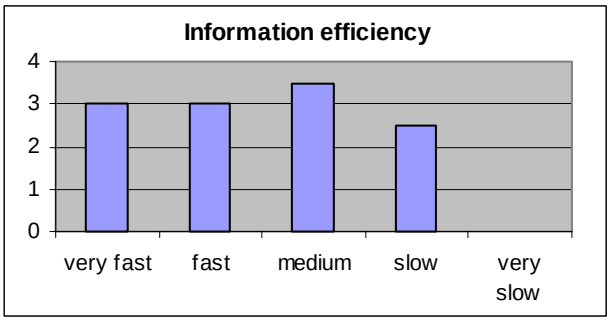
5.1.2 Efficiency issues

What does efficiency mean to you?
Outcome: The most common answer was that it meant tight bid/offer spreads. Other aspects mentioned by several respondents were high liquidity and no arbitrage-opportunities. Some actors even said that it meant speed in the market, possibility to trade in normal volumes and low transaction costs. One respondent had divided the answer into three components – information-efficiency, price efficiency and documentation efficiency. With information efficiency he meant that "all relevant information is available to all market participants simultaneously", with price-efficiency he meant "low spreads and same price for all actors on the market" and with documentation efficiency he meant that there should be "standard contracts for the deals performed".

What do you think about the efficiency in the market?

Information efficiency (How fast new information simultaneously comes to different market actors and is priced in quotes.)

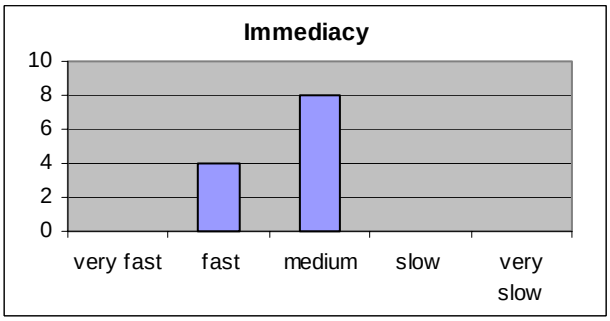
The outcome of the check boxes follows in the diagram below:



One actor who marked "fast" in the boxes said that it was "same information flow as other credit markets (e.g. Eurobond market)". Another actor who market "very fast" in the boxes comments that "information supplied via Internet, daily investment bank updates etc. The relevant information is pretty much the same as the information relevant to the equity market". An additional market participant who marked "very fast" in the boxes stated, "information is generated through same channels as for bonds, and therefore as quick".

Immediacy (How fast a market actor could execute its trading decision and find a counterpart, i.e. from decision to settlement.)

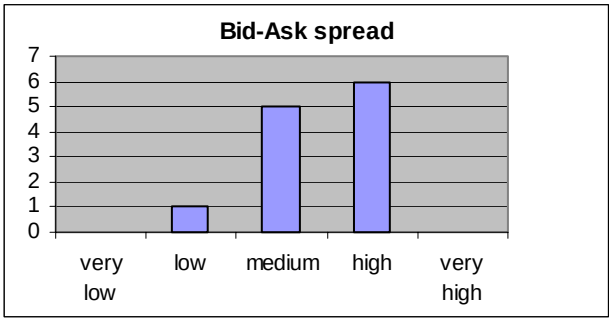
The outcome of the check boxes follows in the diagram below:



One actor who marked "medium" in the boxes commented, "it really depends on the name. Active names can be traded within 1 minute, less active names may take a day (depending on market volatility) or never if the name is not quoted in the CDS market". Another actor who also answered "medium" in the boxes replied: in general relatively good since the documentation has become more standardised. However, for insurance companies there might be problems regarding transformers issues (since they want the default swap to be issued as an insurance".

Bid-Ask Spread

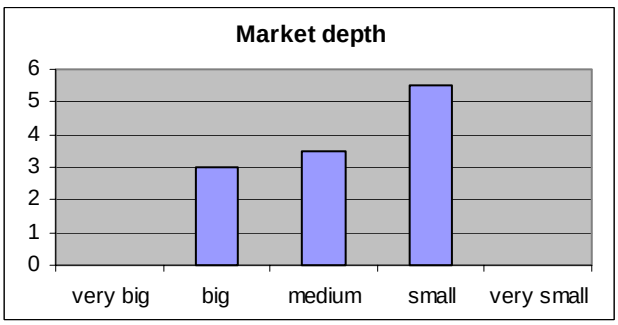
The outcome of the check boxes follows in the diagram below:



One actor who marked "high" in the boxes said, "spreads are still relatively wide". Another actor who marked "medium" in the boxes commented, "in general, liquid names have a bid-offer spread now around 10% of the spread – illiquid names could be wider". An additional market participant commented: "the officially quoted bid-ask spread is often as high as 10%, but the spreads are subject for negotiation. Therefore the true bid-ask spreads are much lower. However, negotiation is time consuming and this causes the market to be less efficient". A further answer said that the bid-ask spread "will probably tighten when more participants come to the market and administration & legal issues are less time-consuming". Another market participant claimed that market depth "depends on the name", meaning that market depth is bigger for larger companies.

Market depth (Describes how much an actor can buy or sell without changing the price.)

The outcome of the check boxes follows in the diagram below:



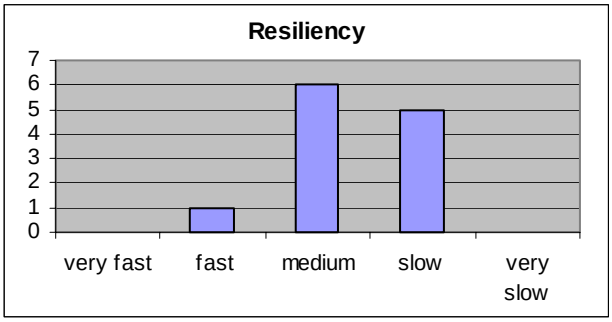
One actor who marked both "medium" and "small" said, " the market can accommodate relatively large positions in investment grade counterparties, but is relatively illiquid for sub investment grade counterparties.

Another actor who marked "medium" in the boxes comment that "really company dependent liquid names would not move the market if dealt in normal market size e.g. EUR 10-20 mln. Some names in the Automotive and Telecommunication sector can be traded in larger amounts (up to EUR 50 mln)".

An additional market participant argued, "we are not one of the largest players on the market, so we have never had any difficulties with the market depth. It might be a problem for larger participants, but it is hard for us to really have an opinion on that". Another market participant claimed that market depth "depends on the name", meaning that market depth is bigger for larger companies.

Resiliency (Describes how fast the market will find a new equilibrium after a temporary liquidity shock.)

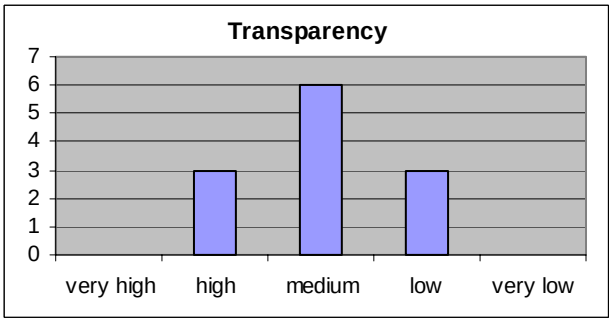
The outcome of the check boxes follows in the diagram below:



One actor who marked "fast" in the boxes commented, "there are large amounts of capital on the market to cover risks, so the supply of risk cover is generally not a problem".

Transparency

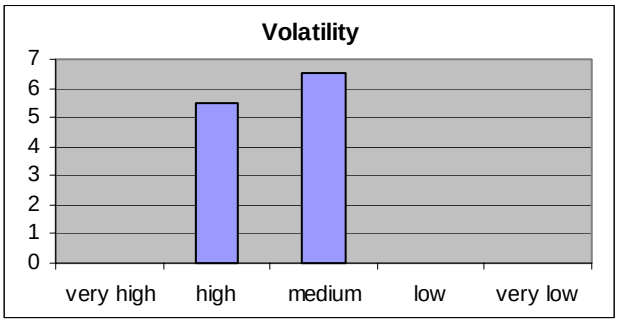
The outcome of the check boxes follows in the diagram below:



One actor who marked "medium" in the boxes said, "transparency is lower for end user since price dissemination is lower than the bond market e.g. names are not published on information services such as Reuters/Telerate". Another actor who also marked "medium" in the boxes commented: generally high, but low for portfolio trades.

Volatility

The outcome of the check boxes follows in the diagram below:



One actor who marked "high" in the boxes commented,"market tends to (over) react to information before stabilisation. Price volatility can be 50 bps intra-day". Another actor commented: "The volatility is increasing, as the credit market is becoming increasingly equity focused (to some extent self-fulfilling since software like KMV is equity driven). However, the volatility among highly rated stable is low. The reason for this might be that trades in these names are buy-and-hold positions."

-Other comments about the efficiency in the market:

One actor said that the efficiency is "improving rapidly every month". Another actor replied, "all depends on the market and which sector you are looking at".

5.1.3 General opinions and visions for future

What do you think are the main advantages/disadvantages in the market?

Advantages

The most common advantage mention was that you can "build positions without cash-market" and that you can take "risk in names where you don't have any outstanding debt". Other answers were that you can make arbitrary trades, hedge and that it gives the possibility to reduce risk.

Disadvantages

The most common answer was that there is a "limited range of available names". One actor argued that the market is "still not commonly used by end users". Another participant claimed that there are "more buyers than seller". An additional actor answer "all the factors listed in your questions above. It is not deep/liquid enough, spreads are wide and pricing is not always rational". Another reply was: "hard to quantify risk in some respects as the market history is limited". We even got the answer: "product has demands on operational and documentation infrastructure which may be too costly for some end-users".

Do you have your own analysts who trying to estimate the traded companies probability of default and then set the price you are willing to pay, or do you take credit ratings from S&P and Moodys for granted and base the price you are willing to pay according to them?

Six respondents answered that they make their own price estimates and three actors said that they take the price for granted. The last three market participants replied that they both make their own price-estimations and that they take the price for granted.

Other comments:

One actor said: "our traders compare our internal price for a particular risk with the market price; this determines our strategy". Another actor replied, "price estimates are only relevant for names that do not have an observable quote where a quote cannot be derived from the bond/secondary loan market". An additional respondent answered that they use "a combination of both internal credit research and official ratings".

Do you think your company will benefit if the credit derivatives market becomes more efficient?

All the respondents answered that they thought that their company would benefit if the market becomes more efficient.

-why and/or other comments?

One respondent answered: "We hedge our illiquid risk with credit derivatives and we make markets. Both of these activities will benefit from improved transparency and liquidity in the credit derivatives market." Another actor said that a more efficient market gives "more active risk management of the banks credit portfolio through ability to trade in wider names and in bigger size". In an additional answer a market participant replied: "Above all, trades done on a portfolio basis can differ significantly in spread from one market participant to another. A higher transparency on portfolio pricing will enhance time efficiency (deals are done when we want to do them). This will also cause the transaction costs to decrease (less price negotiations)." One answer said that the company will benefit "especially when it comes to administration and legal issues". We also got the answer that the benefit will comes with "smaller spreads that mean less costs".

Are you doing anything to improve the standardisation of the structured deal document?

Seven actors answered "yes" and five actors answered "no". Almost all respondents who replied "yes" motivated their answer with that they "contribute to ISDA´s documentation project" or contribution through "revision of ISDA terms". One actor answering "yes" said: "we have agreed on standard documentation with the investment banks we are using as

intermediaries/counterparties. Some participants answering "no" said: "ISDA documentation fulfils our legal standards".

Today, the credit derivatives market is rather unavailable for non-active traders. Do you think that the market will develop so everyone who wants can get access and follow the market without paying for the information?
Seven respondents answered "no" and five respondents answered "yes".

One actor who replied "yes" said: "it's a very important market for many different types of institution and electronic platforms make growth cheap and easy to achieve". Another actor responding "yes" argued, "it will take some time".

The actors who answered "no" had longer motivations. One participant replied: "at best the market will develop along the lines of the bond markets where banks still provide end-users the market liquidity". Another actor claimed, "CDS-prices are already available within most financial systems, (Reuters, Bloomberg, through exchange systems and brokers). It has to be some sort of Internet-based solution then to make CDS available to non-active traders. And even so I assume there would be some cost for those. Since credit-bonds haven't been trading too long on the Internet I assumed that there is at least a barrier of entry getting the financial system needed today". An additional answer was: "Information will become more available, but not in the same ways as for equity markets for instance. The equity market is of much greater interest to the general public since private persons has invested their funds into these markets through direct trades or equity funds. The credit markets do not experience the same market participants, mainly for the reasons: 1) The amounts invested into each trade is significantly larger than for equity trades. 2) To do business on the credit market a good S&P rating (or from another rating agency) is required since the counterparty will have credit risk on the seller of protection." We even got answers like "information is costly to compile and distribute" and "it's an institutional market, the volumes are too large".

Do you think this development will gain your company?
Six respondents thought that a development like this will gain their company and six thought that it will not.

One actor who answered "yes" motivated the answer with: "because we have developed an internal infrastructure to support growth in this business". Another market participant who thought their company will benefit said that "more actors coming into the market when information gets more available".

The actors who answered that their companies would not benefit from free information for everybody motivated their statement with: it "doesn't matter for our business" and "we have access to necessary information". However, an additional participant answering "no" claimed, "more trading, information and actors will give better performance of the market".

What do you think about the market in the future, how will it develop and will it continue to grow?

All respondents thought that the market would continue to growth, and that new participants will come into it. One actor said: "the market will continue to growth exponentially and the more vanilla credit derivatives products will get commoditised." Another market participant answered that "it will be a very active and good market within a couple of years". We also got the answer that it "will become an established part of credit markets". An additional respondent replied, "many banks, for instance, have experienced that they are full of risk on certain corporates. In addition the recent development following the September 11th events, the Enron and Swissair defaults, has shown the importance of being covered against these outcomes."

5.2 Results of measurements

In purpose to compare the seven questions about the actor's view of the efficiency in the market, we calculated the index mean-value for the different questions. The diagram below shows the index mean-value for the different aspects of efficiency according to who the survey was answered. If believe in the diagram, high information efficiency, fast immediacy, high transparency, big market depth, fast resiliency, low bid-ask spreads and low volatility implies high efficiency.

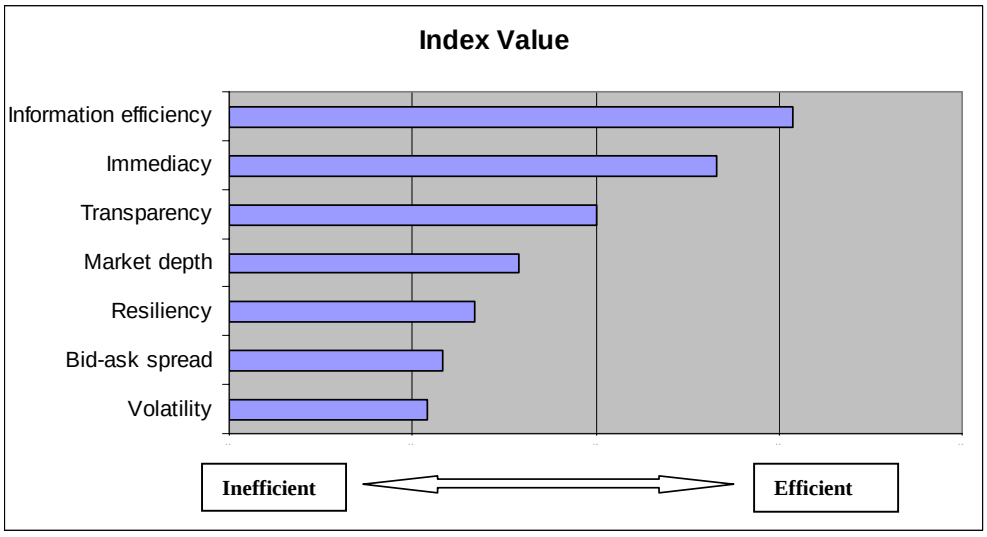


Figure 5.5 Index Value

Since we got an answer frequency of 52.17 % we believe that the answers from market participants above, represent opinions in the market and could be an approximation for the credit derivative market over all. This gives us a good ground to analyse the answers and to integrate them with different efficiency theories in the next chapter.

6. Analysis

In this chapter the material from the inquiry is analysed. We divided the chapter in chronological to see how the market works today and what driving forces develop the market. Finally, we analyse what the future can be like from a best and a worst case.

6.1 Introduction

In this chapter, we aim to analyse the results and divide them in chronological order. First, we start by analysing the market as it works today. Then we continue to analyse driving forces that influences the efficiency. We analyse their importance of market efficiency to see if any of them are more important than others. Finally we state two extreme scenarios and from these views we state our opinions for the future.

6.1.1 How does the market work today?

All companies that answered to our inquiry use some form of credit derivative, this we believe increases the reliability in the answers since we can assume that the answers are opinions based on knowledge and not speculations. All actors had at least been acting in the market for one year; some of them had been in the market since the very beginning in 1996, which allows us to do an assumption that they are familiar with how the market works.

The market has had a significant growth every year since it's beginning in 1996. We do not know what total amount in 2001 was, but estimations said that the total credit derivative market probably was around $ 1.5 trillion. That shows how large amounts of money that are transacted in the market, and we know for sure it is still growing. The first instrument to be invented was the credit default swap. Since then, all different types of baskets and portfolios have been invented. The new financial innovations have been adapted very fast from invention to be widespread in the whole world, and this is according to Oxelheim a sign of high dynamic efficiency.[75] Still, the total credit risk exposure is far higher than the estimated market, therefore we believe it has lots of potential to grow much more. Thus it is worth notice that the volume of contracts traded, which we have been indicated being big, probably reduces the possibilities for small companies to enter the market. The reason for this assumption is the size of the risk, for smaller companies this risk maybe is not big enough in relation to the size of a standard contract. Smaller companies can also think that the premium and transactions costs you have to pay for buying protection is too high.

Obvious, a large part of the deals in the market today are bilateral since most actors marked *"direct against an investment bank"* in our inquiry. It was not a surprise for us, but still, we did not expected to see OTC-contracts more or less dominate the volume traded. To simplify the understanding of an OTC-deal we draw a parallel with a bazaar in Teheran where the

[75] Oxelheim,L., *Financial Market in Transition*, pp. 308-309, (1996)

seller has a Persian carpet, which a proposed buyer has a desire to get. Of course the salesman knows more a about the quality of the carpet than the buyer. First, the seller require a high price that is much above his “break-even”, on the other hand the buyer gives a bid that is below what he is willing to pay. Then the negotiation starts, and finally equilibrium are reached. It is a possibility that one of the actors have had to buy or sell to a price that differs in a negative way from the price they initially wanted. This depends on which actor is most urgent to complete the transaction. This example can work as an illustrative example how the OTC-market works today. At the same time it can work as an example to elucidate the importance of the impact from asymmetric information. In this example the seller knows a lot more about the quality of the good and that indicates that the price will not reach the “true” equilibrium. But if the market is a commodity market where the quality of the good is well known, the price will end up in an equilibrium that is more adequate according to the quality of the good. In the credit derivative market the asymmetric information can play a vital role. Say for example that a bank has a large risk exposure to one of their biggest customers, and then they use an intermediary, to find someone who is willing to sell protection on “their” customer. The protection seller only knows whom the intermediary and what company they are selling protection on is. If they had known who the protection buyer was, they perhaps have been more observant before selling protection, since they can assume that the bank knows more about the good, in this case the company with a large debt in the bank. There are one important thing that neutralizes this situation and that is the role of the intermediary who is using their name as security in the deal. If the protection seller would feel like the intermediate has acted badly, they would probably never work with them again.

It is also of importance to find out whether the buyer or seller side is most urgent to complete transactions in the credit derivative market. In the market today there are more buyers than sellers, which is quite natural in the beginning of a market like this since the innovation of an instrument could most often be derived from a desire from someone to transfer risk to market. In the credit risk market, the desire has arisen especially from the financial sector where banks have been forced to change their credit management and therefore they are more active on the buying side. This distorted relation between number of buyers and sellers is not good for the market. High demand and low supply results in over pricing, with lower liquidity as a consequence, many actors think it is too expensive and therefore they do not enter the market. Lower liquidity leads to high bid-ask spreads and hence the market will remain inefficient. Therefore it is important to see what driving forces that will improve the efficiency.

6.2 Driving forces

We have chose driving forces from both a theoretical and practical view. From the answers on the inquiry we have chosen those issues we think being most important for an improved efficiency.

6.2.1 Information

Looking at the answers about the information efficiency, we notice that there are different opinions among the market actors. Unfortunately, no one of those who marked “medium” or “slow” made any comments. We believe there is a connection between information efficiency and transparency since those who marked “slow” in information efficiency also marked “low” in transparency. It is a possibility that their thoughts about the poor transparency with difficulties to see what happen in the market reflect the answer about information efficiency. Another thinkable reason for marking “slow” is that some actors think they can do risk free profits trading on information who is not discounted into prices.

Our opinions about information efficiency agree with those who marked fast or very fast. The reason is that the same information flow as for the traditionally bond markets affect the credit derivative market, and information about underlying aspects and facts about the traded companies could truly come to the market actors simultaneously. Further, an anonymous actor claimed in an oral interview that a change in rating is discounted into prices already when they have been put on the rating institutes observation list.

A majority of market participants marked “medium” but when reading their answers they seem to be quite unsatisfied with the transparency. On the electronic marketplaces there are few rules for how the market actors should report a deal. It is impossible to see which actors and in what papers there have been trading. Volumes and trading book are unavailable. It is only the intermediaries who can see the information because they try to match buyers and sellers. Because the legal issues for reporting prices and volumes in the OTC market also are very scarce, the transparency in the whole market must be very low. The investment banks handling the trade and do not want to expose any information to other actors.

This problem is another example where one actor has access to information, which is not possible to get for another actor. It is impossible to avoid all forms of asymmetric information since you can not control if your counterpart has better information and know more than you do about the trading object. This is not possible in any financial market. But if all have access to same information at the same time the importance of asymmetric information will decrease. If this should be reality there must be strictly rules for information reports.

A self-experienced situation can work as good example for how the market works today and how hard it is to get accurate information. When we started to investigate the credit derivative market we initially wanted to do some statistical research on for example the historical

bid/ask-spread. We contacted the different market dealers, and at J.P Morgan we first was promised access to their data, but later we got the message that we could not have access, they referred to that the information was "too sensitive". We were surprised since we could not realize what being so sensitive. Other actors answered us in a similar way. When we contacted Professor Didier Cossin[76], who has wrote papers about the credit derivative market, he said that the data he had got from a dealer was confidential. He also pointed out that we were not the first to ask for the data. We are aware of that we are "only" students, but still believe that this is an illustrative example of the low transparency in the market.

6.2.2 Liquidity

The volatility differs a lot among traded names. From a theoretically point of view, Niemeyer writes that volatility is necessary in a short perspective. No volatility results in impossibilities to do short speculations, which will affect the liquidity. Volatility attracts speculators to the market, which leads to increased liquidity. Markets are dependant in some volatility to remain the liquidity. Generally, you can assume having market participants acting as market makers, there must be some minimal order flow with different market actors who wants to buy and sell. Nevertheless, high volatility means high risk and that is not good for the market since we believe that there are very few actors who speculate and trying to gain from a volatile market since most of the trading seems to be buy and hold positions. If the trend with a rapidly growing market continues, the volatility will decrease and hence the market becomes more efficient from a market microstructure perspective.

According to the answers, the immediacy is better than we thought. An explanation of this can be that the actors who marked "high", trade in small sizes and therefore they always can execute their trading decision and find a counterpart fast. Naturally, it is easier to finish a deal in a highly traded paper compared to a smaller traded paper. This makes it difficult to draw a single answer on the efficiency when looking at immediacy. As it mostly works today an end user who wants to protect against credit risk, compare the price between different intermediaries, in reality the major investment banks. The market maker, who offer the best price get the business transaction. If you have to deal between different investment banks for execute a trading decision, immediacy could according to us hardly be especially fast.

This process to find the best price is both costly and takes relatively long time. It is difficult to see the depth of the total market because there is rather small trading on the market places. We have previous stated that there are less sellers than buyers in the market, this also affect the depth. There are similarities between the depth and immediacy issues because both seems to be dependent on the size of the tradable company. Actors have indicated that some companies in the Automotive and Telecommunication sector can be traded in relative large volumes and of course the opinion about the depth from market actors are dependent on the

[76] Professor Didier Cossin has written several papers about credit risk.

size of their "need" to buy or sell protection. It is still more protection buyers than sellers but both the seller and buyer side are growing in the market and it is a prerequisite for better efficiency that the balance between both sides becomes relatively stable.

One important issue to test, whether a market is efficient or not, is to test resiliency and how the market cope with a temporary liquidity shock to see how fast it reach a new equilibrium. We did not get many comments about how the market works in such a situation thus we got indications of a quite slow resiliency. We believe that one explanation of the few comments can be that the market never really has had a liquidity shock and therefore the test has not been done. Still, we do assumptions about the resiliency since we can see the structure of the market, by that we mean small volumes on the electronic market places and big volumes in OTC-contracts. We believe that such a market structure will have difficulties if there would be a liquidity shock. For example, a crash in the equity market would cause severe problems in the credit derivative market. The credit derivative market has become more equity-driven and would therefore also follow the movements in the equity market. Even if many positions are said to be buy and hold positions, everyone wants to trade, or at least be able to trade the derivatives when the risk is increasing. It would be hard to trade the OTC contracts and probably also the derivatives in the market places. There are similarities with a stock market with low liquidity, where the possibilities to abandon a market in a crash is small. This means that the credit derivative market is in need for a higher overall liquidity to handle a temporary liquidity shock.

6.2.3 Market places

We have found three Internet platforms that offer trading with credit default swaps, but it seems like the Internet marketplaces that are used; work more as a benchmark for the bilateral contracts than as a market place. When we study what instruments being used most frequently, not surprisingly we find that the credit default swaps dominates the market. At the same time it is hard for us to guess whether the credit default swap is traded independently or as a part in tailor made solutions for protection buyers. One thing that makes an assumption like this non-reliable is the fact that the OTC market is not transparent. Almost all participants using credit derivatives, seems to act both on the sellers side and the buyers side.

Many actors want to have a well-functioning platform to use. The fact that the major investment banks have started to collaborate to increase the liquidity in the marketplaces is a proof of market participant's ambition to create a market community. Since the credit derivative market is global it is difficult to see an existing exchange expand to include all credit derivative trading worldwide. But since the trend within exchanges is to be autonomy companies, a possibility is that companies like Sweden's OM-group could establish a global market place. A more realistic scenario would be a joint venture between the largest investment banks in purpose to develop *one* global market. At first it may seems strange to

realise how investment banks, which also are ordinary market actors, could be the "owners" of the market. Some people may say that this would result in a situation where the investment banks would benefit themselves on the expense of other actors. We do not believe this will be the case, in fact we think that a joint venture would result in better pricing since they will have to adopt one accepted method for pricing credit derivatives.

Looking at current prices on the electronic marketplaces, bid-ask spread are high. One market participant said, the bid-ask spreads are high from the beginning but it is a negotiation process and finally it usual ends up in a reasonable level. This of course is a problem and is evidence from the lack of a general pricing model, the minor use of the electronic marketplaces and the presence of more than one marketplace. We argue for only one electronic platform in opposite to the current situation where three platforms compete against each other. This have led to a divided market where different actors use different electronic marketplaces. The total amount of transactions in the marketplaces is too small to get three well functioning and efficient electronic marketplaces. The result of this is bad liquidity and small volumes, which lead to low efficiency in all three marketplaces instead of one marketplace with an improved and better efficiency.

6.2.4 Pricing

The pricing issue is a very important issue for the market becoming more efficient. We have no reason to question the academic models done, but we think the fact that no model so far is totally accepted by the market is a big problem. A majority of the market participants answered that they make their own price estimates and this of course depends on that there are no commonly accepted technique or formula for calculating the price. If many market participants are calculating their price willing to pay in many different ways the market must be very fragmented. Therefore it must be very hard to get high efficiency in the market.
Three out of twelve actors take the prices on the market for granted. If the statement from some market actors, who claim that the credit derivatives market offers good opportunities to make arbitrage profits is true, it must implies that the actors taking the prices for granted make losses in the market.

6.3 Future

In this part we first present two extreme scenarios, a best and a worst case for the future. After that follows our own discussion related to the inquiry about what changes must be done for better efficiency and what we think is realistic to come true.

6.3.1 Best case

In the best case scenario an electronic platform managed by the major investment banks has established and the participants have agreed upon one general pricing model equivalent to the Black&Scholes-model. An increased focus on credit risk management will appear, not only for banks but also for governments and non-financial companies with high credit risk

exposure. This results in a huge increase in liquidity and number of sellers. The rise in number of protection sellers depends on both more speculators on the market and that ISDA and other authorities have constructed a standardised legal and regulatory framework, which include new risk weights leading to a more dynamic approach of credit risks. The legal and regulatory framework with requirements for better information distribution also leads to better transparency. All the above conditions result in an almost perfect efficient market.

6.3.2 Worst case

In the worst case scenario no general pricing model has been developed since the actors in the market can not accept one single model. Further on, the market has not been able to agree upon a clear regulatory and legal framework. This has resulted in a stand still situation where actors are unwilling to enter because of the uncertainty in the market. The limited number of participants will affect the liquidity severe. A new economic boom is present and number of defaults decrease dramatically. This results in a general lower interest for credit risk management and a small number of entrances from new actors in the market. All the above conditions result in almost a total inefficient market.

6.3.3 Realistic scenario

Today the liquidity is high in some companies, but in other listed companies, liquidity is extremely low. To create a situation with an increase in liquidity and more actors willing to join the market, we think there has to be an adjustment in the size of the contracts in purpose to facilitate for smaller actors to trade. We think that a future possibility to trade in smaller volumes is important if the market should have a chance to develop in a way with more end users, creating a market with higher liquidity, which implies higher efficiency.

All participants have responded that they will benefit from a more efficient market. This seems very obvious at a first glance. A more efficient market means for example possibilities to trade in wider names and in a bigger depth, which give increased opportunities for end-users to run a more active risk management of their credit portfolios. It also results in lower spreads and hence lower costs.

Better efficiency in the future will not only be an information issue. When liquidity increase, the market from a market microstructure perspective, becomes more efficient and with higher liquidity the market will be faster when an actor will execute a trading decision, i.e. the immediacy will be better. Also the bid/ask spread becomes lower, you can trade in larger volumes without changing the price and the market finds equilibrium faster, i.e. the resiliency will be faster.

Nobody say it, but still we think that some actors benefit from an inefficient market. The intermediaries can charge buyers for more systematic risk than necessary, because the lack of a well-accepted method for pricing and the fact that there are more protection buyers than

protection sellers. Nevertheless, according to the answers, it seems like everyone think that better efficiency is more important than this profit opportunity.

It is hard to say if the market will become more open and available for everyone. There are a bit of ambivalence for the dealers who today have information, on one hand they can profit from the fact that they have asymmetric information and that is valuable, but on the other hand, many or most of the dealers are interested in seeing the market grow. We can assume that the primary way of making money for a dealer is by increase the volumes and the liquidity.

You can also claim that there is no use for other than the market actors to have access to the market. Public has no interest in the market because they will never use it. On the other hand, it is not a big technical problem to make an electronic marketplace available for everyone, and that might be good for the efficiency. If journalists, analysts and other interested parties, start to follow and watch the market, the general attention increases. For example, if the market is obvious inefficient and a journalist write about it, people pay attention to the problem and arbitrageurs enter the market in purpose to gain from the inefficient market conditions. This in turn forces the market to equilibrium and the arbitrage opportunities disappear, -the market becomes more efficient. Another spectacular point can be the interest for the entire society to get the credit derivatives market more open and available for everyone. Nobody wants to see a new bank collapse like the one in Sweden in the early 90´s where incompetent credit control caused big problems for the society and private persons. If the banks had tried to transfer more risk into the market instead of taking it all themselves, a well functioning credit derivatives market could have been established and that would have mitigated the bank collapse in the early 90´s.

More actors and higher turnover follow as a direct consequence from a more open market. Of course, this is good for all actors on the market. A market available for all can in future leads to entrance from actors outside the bank and insurance sector. Today, governments only represent one percent of the total market. It is an excellent example of potential actors who can gain from the market. Look at this example: if a country have lending out a large amount of money to Argentina for a year ago and they start to feel insecure about the financial situation, they could go to the credit derivatives market and buy protection. Of course, they must pay a large premium but it probably had been worth it if you look at the situation today. The public could even perhaps welcome this, since the governments would lower their risk and at the same time take advantage of the global financial markets instead of being forced to follow it. Imagine what a huge increase in liquidity it leads to if countries also start to use the market.

The pricing problem will be a major issue for the future. The best solution according to us is the case where the major investment banks start a kind of joint venture and run an electronic marketplace. Both academics and market actors try and have tried to find new models for

pricing credit derivatives. It is not realistic to think that a commonly accepted pricing model does not have any insufficiencies, but this is not a very big problem. Most important is that there is one model, which every market participants decide to use. If a better model appears it is up to the market to adapt this new pricing model, how fast this product innovation is adopted is also a measure of dynamic efficiency.[77]

Today, despite the attempts from ISDA making the market more standardised and homogenous there are few legal and regulatory rules that you must follow in the market. In the future, it takes that ISDA sets strictly rules, which all market actors follow. Requirements about openness for every single deal, for instance, everyone should be able to see which orders are available, in what names and in what volumes there have been trading. This is very possible to happen. All participants cooperate with ISDA and they have a strong position on the market. According to Walter contract design in purpose to increase the integration of a marketplace is an example of process innovation, making the market more dynamic efficient.[78]

Another legal issue that will affect the credit derivative market is the new framework for bank capital treatment, Basel 2. This new approach will give the opportunity for banks to have a more dynamic view on their risk exposure since the new framework uses external ratings, which is much more adequate to a company's risk. But as has been mentioned before, the problem with the external rating approach is that there are relatively few companies rated by the rating institutes. And that will barrier the possibility to have more traded names in the credit derivative market.

The credit derivative market can also work as an opportunity for a bank or another company to increase their return. If you sell protection in a company that you think will not default you receive payments from the buyer. Take Ericsson as an example, a protection seller receive an annual premium of 2,45 % for the next five years.[79] 2,45 % might sounds small but if you take into account that the seller do not have to tie up capital and can invest the value of the contract in a Treasury bond for example, the total return from selling protection can be the riskfree interest rate +2,45%.

[77] Walter, I., *Understanding the structure and dynamics of global financial flows*, pp. 614-615, (1997)
[78] Ibid
[79] Morgan Stanley, *European default swap levels, 14/11, (2001)*

7. Conclusions

In this chapter the thesis is finished by the conclusions drawn from our qualitative inquiry and the different efficiency theories. Finally the writers give suggestions for future research.

The answers from the inquiry are a prerequisite for us to be able to draw a conclusion whether the academic concepts indicate efficiency or not. We link the different academic concepts to the theories we have chosen and state if each one of the valid theories is efficient or inefficient. After that we can say if our hypothesis, which state that the market is inefficient, is true or false.

Information efficiency- We have noticed and can claim that the information efficiency in the credit derivative market is good. The reason for the statement is that the same information flow as for the traditionally bond markets affect the credit derivative market, and information about underlying aspects and facts about the traded companies come to the market actors simultaneously. For example a decrease in credit rating is discounted into prices long time before the actual day for the downgrade.
EMH: *Efficient*

Immediacy- The answers from our inquiry indicated that immediacy is relatively high, but we do not believe this is the case. Most of all trading with credit derivatives is done in the OTC-market and since this trading process involves a situation where the buyer tries to find the seller with the lowest price and that takes a long time. Because of that we actually consider the immediacy low.
Market microstructure: *Inefficient*

Bid/Ask-spread- When looking at the market place you can see that the bid/ask-spreads are very high. But after we got the participants view in this issue, we have realised that the bid/ask-spreads in the market do not reflect the actual prices. The pricing process involves a negotiation and the actual bid/ask-spreads seem to be reasonable, therefore we consider this efficiency issue rather good.
Market microstructure: *Medium efficient*

Depth- The depth in the market seems to be good in large names, but in most cases the low liquidity results in a very small depth for the majority of listed companies. The fact that there are relatively few sellers in the market also affects the depth. These facts make us think the depth is inefficient.
Market microstructure: *Inefficient*

Resiliency- As far as we know there have never been a liquidity shock in the credit derivatives market. This means that it is difficult to draw any conclusions about resiliency. We can only speculate in this matter and we think the resiliency is low, due to low liquidity in electronic marketplaces and difficulties in abandoning OTC-positions.
Market microstructure: *Inefficient*

Transparency-There are few rules on both the electronic marketplaces and in the OTC-market that regulates the giving of information from the actors in the market to general public. For example, volumes and trading books are unavailable information for everyone except the intermediaries. Therefore, we claim that the transparency is low
Asymmetric information: *Inefficient*

Volatility- Some market participants have indicated that the volatility in companies can be high. One explanation for this can be that market tends to overreact to some information. This assumption is supported by the trend for credit derivatives, which seems to be more and more equity driven. Nevertheless, the volatility in highly rated companies tends to be stable, this we interpret as the volatility is medium efficient.
Market microstructure: *Medium efficient*

From the above conclusions we state if the different theories are efficient or not. We are aware of that the theory about financial innovation is not mentioned in the conclusions above. The credit derivative market itself is a financial innovation and the instruments used are also financial innovations. We claim that since the market has adopted so many new instruments in a short time, which has became accepted worldwide, the market according to financial innovation theory is efficient.

From the above conclusions we measure the total efficiency in the credit derivatives market. To do this we compare all the above conclusions with each other and give the answer on whether the credit derivative market is efficient or not.

According to EMH and financial innovation theory the market is efficient. On the other hand the market is inefficient from a market microstructure and an asymmetric information perspective. This point out that the new and undeveloped credit derivative market has taken a step in the right direction but according to our model below it is still inefficient and hence there are more steps to take before you can claim the market efficient.

To facilitate the understanding of our method for measure the efficiency, we have created an illustrative model where we show the linkage between all four theories. If all these four theories are considered efficient we believe that the whole market is efficient. We have named our model the SPAK-model.

The SPAK-model

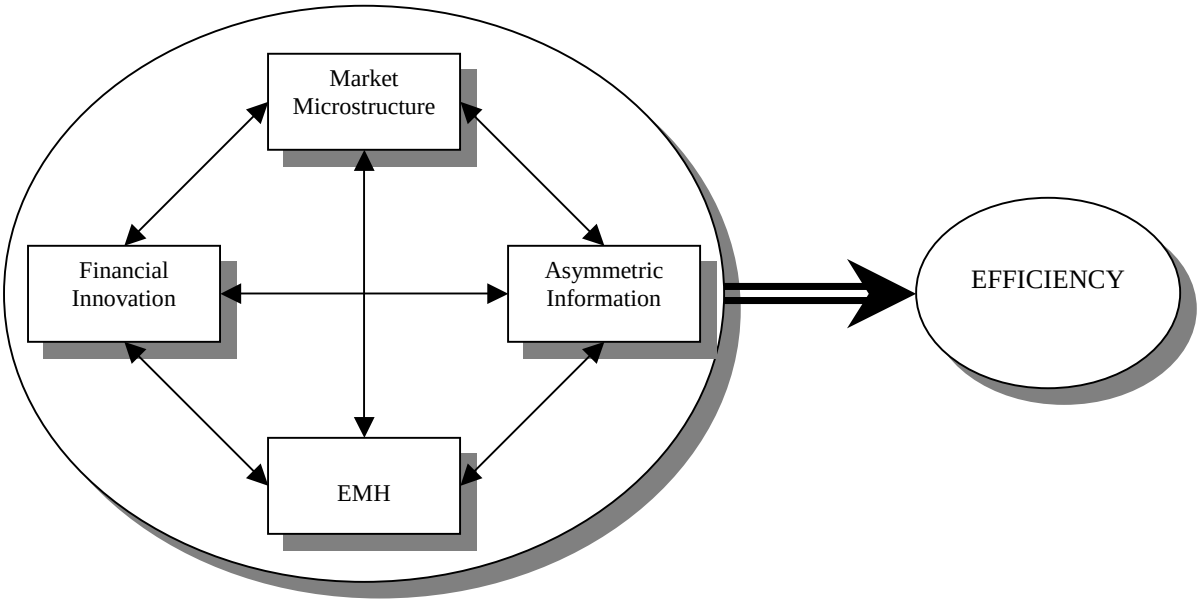


Fig. 7.1 SPAK-model

7.1 Suggestions for future research

We think it would be interesting to investigate the efficiency in the credit derivatives markets again in a few years. Maybe a well-developed electronic market place will handling most of the credit derivatives trading in the future. In case of a future electronic market place with higher transparency, it would be interesting to investigate the efficiency in the market from a statistical approach using historical data.

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Appendix 1 - Inquiry

Name:
Company:
Title:

1. Does your company use credit derivatives? Yes ☐ No ☐

- If yes, which instruments (please specify percentage trade in each instrument)?

☐ Credit Default Products %
☐ Portfolio/CLO:s %
☐ Asset Swaps %
☐ Total return Swaps %
☐ Credit Linked Notes %
☐ Baskets %
☐ Credit Spread Products %
☐ Other %
– please specify other instruments:

- If no, why?

2. Do you act as a protection seller or protection buyer? seller ☐ buyer ☐ both ☐

3. How much notional value, in dollars, do you trade during a year?
$ which include % as protection seller, and % as protection buyer.

4. How long have you traded on the credit derivatives market?

5. How has the market developed during the time you have been a participant?

6. How do you trade?

☐ Morgan Markets
☐ Creditex.com
☐ Credittrade.com
☐ You act as a market maker
☐ Direct against Investment bank connections
☐ Other, please specify:

7. What does efficiency mean to you?

8. Do you think your company will benefit if the credit derivatives market becomes more efficient?

Yes	No
☐	☐

- why and/or other comments?

9. What do you think about the efficiency in the market?

- Immediacy

(How fast a market actor could execute it´s trading decision and find a counterpart, i.e. from decision to settlement.)

very fast	fast	medium	slow	very slow
☐	☐	☐	☐	☐

Comments:

- Information efficiency

(How fast new information simultaneously comes to different market actors and is priced in quotes.)

very fast	fast	medium	slow	very slow
☐	☐	☐	☐	☐

Comments:

- Bid-ask Spread

very low	low	medium	high	very high
☐	☐	☐	☐	☐

Comments:

- Market depth

(Describes how much an actor can buy or sell without changing the price.)

very big	big	medium	small	very small
☐	☐	☐	☐	☐

Comments:

- Resiliency

(Describes how fast the market will find a new equilibrium after a temporary liquidity chock.)

very fast	fast	medium	slow	very slow
☐	☐	☐	☐	☐

Comments:

- Volatility

very high	high	medium	low	very low
☐	☐	☐	☐	☐

Comments:

- Transparency

very high	high	medium	low	very low
☐	☐	☐	☐	☐

Comments:

- Other comments about the efficiency in the market:

10. What do you think are the main advantages/disadvantages in the market?

-Advantages:

-Disadvantages:

11. Do you have your own analysts who are trying to estimate the traded companies probability of default and then set the price you are willing to pay, or do you take credit ratings from Standard & Poors and Moodys for granted and base the price you are willing to pay according to them?

Make own price-estimates: ☐
Take prices for granted: ☐

Other comments:

12. Are you doing anything to improve the standardisation of the structured deal document?

Yes	No
☐	☐

- If yes, what?

- If no, why?

13a. Today, the credit derivatives market is rather unavailable for non-active traders. Do you think that the market will develop so everyone who wants can get access and follow the market without paying for the information? Yes ☐ No ☐

why:

13b. Do you think this development will gain your company? Yes ☐ No ☐

why:

14. What do you think about the market in the future, how will it develop and will it continue to grow?

If you want an electronic copy of our thesis when completed, please write your e-mail address here:

Thank you for your participation!