Credit Default Swap and Market Risk

Does trading Credit Default Swaps decrease credit risk, but simultaneously increase the market risk of banks?

Bachelor's Thesis Finance

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Abstract

With the credit crisis of 2007 still fresh in our memories, the credit risk transfers from banks in the financial system have been often criticized. Especially Credit Default Swaps (CDS) have been accused of being one of the causes of the crisis in recent literature. I study the systematic risk of CDS-trading banks by estimating the market beta before and after they traded CDS. The market beta increases significantly after buying CDS, indicating that the banks became riskier. Separating this beta effect in a volatility and a market correlation component shows that this increase is due to higher bank correlations. While buying credit protection trough CDS decreases their individual credit risk, they unintentionally increased the market risk. This is a typical example of a miscalculation of overall risk, because credit risk and market risk were implemented separately instead of together.

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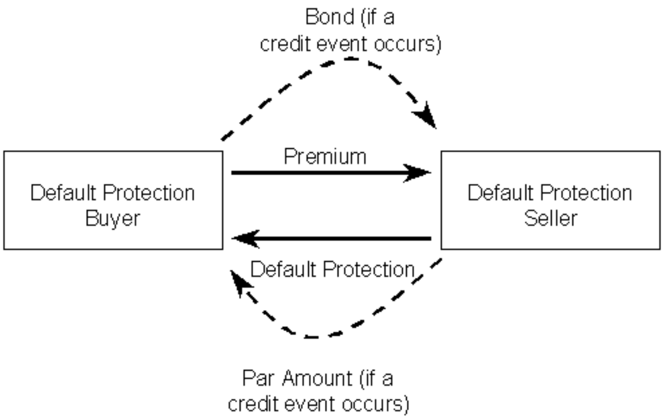
1: Introduction

The world experienced a severe financial crisis since 2007 and we are still bearing the consequences today. Many factors have contributed to this crisis. Some of these were quickly identified, because their effects were known before. Of course, there are also factors, of which the effect on this particular crisis has not been proved. One is the credit risk transfer among financial entities. This is done trough credit risk derivatives.

There are different types of credit derivatives: credit default swaps, total rate of return swaps, synthetic collateralized loan, debt and commercial paper obligations. By far, the most commonly used credit derivatives are credit default swaps (CDS). These derivatives are relatively new to the financial world; they were introduced by JP Morgan in 1997.

A CDS is a contract in which the protection buyer pays a premium to a protection seller to insure himself against is possible losses on his exposures to individual loans. If the counterparty of the loan defaults, the protection seller has to pay the amount instead. In contrast, if the counterparty does not default on its loan, the protection seller makes a profit from the premiums (spreads).



Defaulting on a loan is referred to as a credit event. There are six original types of credit events that can be incorporated: Bankruptcy, failure to pay, restructuring, repudiation, obligation default and obligation acceleration (Tolk, 2001). The first two are pretty straight forward and the most common credit events. Restructuring is often referred to as distressed exchanges, which are attempts by a firm to prevent bankruptcy. A repudiation is a declaration by the counterparty, that he does not intend to live up to his obligations. Both Obligation default and obligation acceleration refer to any default other than a failure to pay.

CDS allow banks to transfer their credit risk to other (less fragile) institutions, or other banks. This does not only decrease the protection buyers' credit risk, the premiums paid on these swaps are also an easy way to make money for the protection seller. But the CDS market also plays an important informational role. According to Terzy N (2011), the CDS market is one of the purest and most responsive indicators of corporate financial health. It offers a great deal of information that can be profitably used by asset managers. The information from CDS spreads can also alert regulators to problems at financial institutions. Federal reserve chairman Greenspan (2004) found that CDS have contributed to the development of a far more flexible, efficient, and hence resilient financial system than existed before. Also Rule D, (2001) found that CDS have the potential to improve the financial system. A CDS offers a pure exposure to credit risk, which makes them a good benchmark for other credit instruments. Also, the CDS market is more standardized than the bond and loan market, which may make it easier for intermediaries to hedge CDS positions.

The CDS market was, and might still be very promising and the trading of CDS increased tremendously in the years before the credit crisis.

A properly done transfer of risk should, in theory, reduce the banks' risks and increase financial stability. But the recent financial crisis has focused the world's attention on CDS in a negative way; they may increase the systematic risk of the financial sector (Nijskens & Wagner, 2010). Banks may hedge any undiversified exposures by buying protection using CDS. The credit risk of these exposures will then be transferred to other banks (or any other financial institution). Meanwhile, they may also sell protection trough the CDS market. If banks buy and sell credit protection to each other, they may become less risky individually, but they also may end up being more correlated with each other (Wagner, 2008). This higher correlation increases the likely-hood that banks incur losses jointly, which happened in the 2007 crisis.

In their research, Nijskens & Wagner (2010) found that trading CDS increased the market beta of the relevant banks. The market beta measures how much the volatility of a stock depends on the volatility of the market. By splitting this beta into individual risk (A bank's standard deviation relative to the market's standard deviation) and market risk (correlation with the market), they also found that trading CDS decreased the risk of the banks individually (lower variance), but increased the risk of the financial system (higher correlation with market).

In this paper, I will also focus on the relationship between credit risk and market risk and particularly on the relationship between trading CDS and the market beta. The main question to be answered is: What is the effect of trading CDS on the credit risk and market risk of banks?

First, I will present a theoretical background of the relationship between credit risk and market risk and the effects of CDS on the credit crisis. After the theoretical part I will do an empirical analysis about the effects of selling and buying CDS on the market beta of banks and investigate the cause of this change.

2: Theoretical background

This section consist of three parts: In part one, I will summarize various papers about the relationship between credit risk and market risk and how these two types of risk should be managed. In part two I will explain how managing credit risk, trough CDS in particular, might have had any influence on the financial crisis.

2.1: The relationship between credit risk and market risk.

I will start by explaining the difference between market risk and credit risk briefly. Market risk is defined as the risk that a financial position changes its value due to the change of an underlying market risk factor, like a stock price, an exchange rate or an interest rate (Breuer, Jandacka, Rheinberger & Summer, 2010) Credit risk is the risk that a counterparty defaults on its loan. Credit risk exposures are generally more specific (specific loans that bear a certain amount of risk) than market risk exposures. However, some risk factors may influence both market risk and credit risk. For example: interest rate change is a market risk factor, but if an interest rate increase causes a firm to default on its loan it also becomes a credit risk factor.

For many reasons, market and credit risks have often been measured separately and managed separately. The development of credit risk transfer markets, like the CDS market, has raised questions regarding the measurement of risk. Market participants have argued that an integrated measurement and management of market and credit risk is a more accurate measurement of risk. The recent financial crisis has illustrated how the two risks may generate large losses if not managed jointly.

Instead of measuring market risk and credit risk separately, Jobst, Metra & Zenios (2006) combined several market risk and credit risk models. They found that these models, which jointly take into account multiple sources of risk, calculate total risk more accurately than models which calculate risk separately. Why does a combined risk model measure total risk better than several single risk models?

According to Hartmann P (2009), credit risk management and other types of risk, such as market risk, should be seen as related and should therefore not be implemented differently.

This is in line with Jarrow and Turnbull (2000), who stated that market and credit risks are intrinsically related to each other and, more importantly, they are not separable.

Breuer et al (2008) also state that positions in a portfolio depend simultaneously on both market and credit risk. They found many cases in which calculating market and credit risk separately and then adding them up will underestimate overall risk (the whole is greater than the sum of its parts). Only if a portfolio really is separable into market and credit sub portfolio, we can be sure that calculating regulatory capital independently for market and credit risk will calculate the total risk accurately. But if portfolio positions depend simultaneously on market and credit risk factors, the nature of the risk assessment problem changes. Calculating market and credit risk separately, is then based on a wrong portfolio valuation and leads to a wrong assessment of true portfolio risk.

Research group IMCR (Interaction of Market Risk and Credit risk), found that the way in which banks aggregate market and credit risk has a very important impact on the precision with which they capture their overall risk exposure. The group also concluded that the differences between market risk and credit risk should not be overstated (BCBS, 2009)

2.2: Credit Default Swaps and the credit crisis

The literature above agrees about the fact that there's a relationship between market risk and credit risk .Moreover, credit risk and market risk should not be implemented differently. But how did this relationship come into practice in the years before the crisis and how exactly can this be related to the CDS market?

Since the CDS market is relatively new, it was not yet fully mature; and it had not been tested during an economic slowdown (Rule 2001). In its state, it did not effectively unbundle credit risk from other risk, including market risk (Tolk, 2001). Duffee & Zhou (2001) argue, that the CDS market can directly benefit the banks, but the effects of the CDS market could meanwhile harm other markets for sharing risk. They found that the new CDS market could alter the investors' expectation of the quality of loans in (in their case) the loan-sale market and thereby dramatically change the equilibrium in this market. According to Terzy (2011), the problem laid within the CDS market; Although he stated that the CDS market is one of the purest and most responsive indicators of corporate financial health, he also found that the market was very unregulated and suffered from lack of transparency, efficiency and liquidity. In other words, CDS trading was implemented inadequately. It was this inadequately implementation of credit risk transfers, which may have caused contagion between financial institutions and therefore increased systematic risk.

Contagion refers to a chain-reaction, where bad performance of a small group of banks eventually effects the whole financial system. Jorion and Zhang (2009) specify this contagion as credit contagion. They found that bankruptcy announcements caused negative equity returns of other banks and increased the CDS spreads (the premiums paid on a CDS). The fear of counterparty defaults among financial institutions explains the worsening of the credit crisis, because banks were getting afraid to trade with each other. In other words, if a CDS protection seller did not have enough reserves to cover his CDS liabilities, he might default on his obligations himself, leaving the CDS buyers empty handed. This, in combination with the fear of default, could have lead to a chain-reaction of actual defaults, posing more risk into the financial system.

A simple example of contagion due to CDS trading is the following: If bank A sells credit protection to three banks (B, C and D) and simultaneously buys credit protection from bank E it has CDS exposures as both guarantor and beneficiary. If bank E goes bankrupt, bank A is no longer protected against counterparty default, because E will not be able to compensate. If the counterparty indeed defaults on its loan, bank A might not be able to fully compensate banks B,C and D in case of a credit event, because it does not have enough reserves. Bank B, C and D's income is now also no longer guaranteed and they all fear they might get distressed. This effect might go from banks B,C and D to banks F,G and H and so on, thereby causing an economic crisis.

The contribution of CDS to the credit crisis has however, not been globally accepted. Although empirical analyses have concluded a relationship between CDS trading and market risk, it does not necessarily prove that CDS caused the financial crisis. There are many other factors that have not been considered in these analyses. Stulz (2010) stated that the deep dramatic problems of the financial credit crisis were not caused by credit default swaps, nor by other financial derivatives. According to him, the crisis was driven by 2 factors. First, investors and financial institutions generally did not expect that real estate prices would fall dramatically. And second, many financial institutions were operating with extremely high levels of leverage and held large investments in subprime securitizations, so that large unexpected losses could quickly lead market participants to question their solvency. Also many governmental institutions, banks and other financial institutions deny that CDS caused the economic crisis. ISDA (international swaps and derivatives association) and the German central bank for instance, explicitly state that CDS have not caused the financial crisis.

Because of the complexity of the situation, the target of this paper is not prove that CDS caused the financial crisis, but only to study if CDS trading has decreased the credit risk and simultaneously increased the market risk of banks.

3: Data and Methodology

In this section I will explain how I estimate the effects of trading CDS on the market risk and what data I used in my research. I will explain the variables I included in my analysis and which banks were included in the sample. This section will end with the descriptive statistics of the variables used in the regression analysis.

3.1: Methodology

The empirical analysis consists of two parts. In the first part, I estimate the effect of CDS trading on the market beta of banks. In the second part, I try to find the cause of the results of part one.

3.1A Estimating the Market Beta

I estimate the market risk by estimating the market Beta of the banks. To do so, I use the CAPM formula, thereby following the research of Nijskens & Wagner (2010). The formula is:

$$R_{i,t} = \propto_i + \beta_1 . R_{m,t} + \in_{i,t}$$

In this formula, $R_{i,t}$ is the excess return of the individual banks at time t and $R_{m,t}$ is the corresponding excess return of the market a time t. For the market return, I use the MSCI world index. Both the banks' return and the market return are excess returns over the risk-free rate, for which I use the 3-month US Treasury Bill rate. The risk-free rate is in dollars, because the bank's returns are also translated into US dollar. From this formula, the market risk can be estimated trough the market Beta (β_1). $\propto_i$ is the fixed effect of the banks individually and $\in_{i,t}$ is the error term.

Now, to study the effect of the CDS exposures on the market Beta, I use three variables to measure the effect of trading CDS. All three variables are dummy variables and are named D^{sell}, D^{buy} and D^{both}. From this point, my research will differ from Nijksens & Wagner (2010). They did not differentiate between selling and buying CDS, but considered them both as CDS trading. Instead, they focused on the short term, and long term effects, which is not included in my research. Moreover, Nijksens & Wagner did not consider the possibility that a bank stopped trading CDS. They estimated the beta effect of trading CDS from the first CDS exposure reported till the end of the time period. Therefore their dummy variables are treated as event windows and mine are just events. They also included an abnormal return variable, which is intended to measure any abnormal return associated with the CDS event.

I chose to differentiate between CDS selling and buying because I expect their effects on the beta to be different due to their different purposes. Banks buy protection to hedge credit risk, but sell protection to receive the premiums. They might therefore also consider the risk on their exposures differently.

The dummy variables will indicate at what times the bank sold and/or bought a CDS. D^{sell}will take value 1 at the times that the bank was selling credit risk protection, and 0 otherwise. If D^{sell} takes the value 1 at time t for the first time, then this is the date at which the bank started selling CDS. In case this bank stops selling CDS, D^{sell} will take value 0 again. D^{buy} will take the value 1 at the times that the bank was buying credit risk protection, and 0 otherwise. This dummy will indicate at what times, the bank started and stopped buying CDS. If, at time t, the bank both sold and bought CDS then both dummies take value 1. D^{both} can then be calculated by multiplying D^{sell} and D^{buy}. This dummy will only take the value 1 as the bank both sold (D^{sell}=1) and bought (D^{buy}=1) CDS at the same time. Note, that with these dummies, I do not consider the notional amount of CDS contracts outstanding., which differs for each bank.

Including these dummy variables, the expanded formula is now:

$$R_{i,t} = \propto_i + \beta_1 . R_{m,t} + \beta_{2.} D^{sell} + \beta_{3.} D^{buy} + \beta_{4.} D^{both} + \in_{i,t}$$

With this formula, the effect of trading CDS on the bank's return can be estimated by calculating $\beta_{2.}$ β_3 and β_4. Yet, the purpose of this study is not to estimate the effect on the banks return($R_{i,t}$), but on the market Beta (β_1). Therefore, I also calculate the interaction terms of the dummies with the market return (($R_{m,t} \times D^{sell}$) ,($R_{m,t} \times D^{buy}$) and ($R_{m,t} \times D^{both}$)). The values of these interactions terms are calculated by multiplying the variable $R_{m,t}$ with the three dummy variables. Per example: ($R_{m,t} \times D^{sell}$) will take the value 0 if D^{sell}=0 and the same value as $R_{m,t}$ if D^{sell}=1. The same applies for ($R_{m,t} \times D^{buy}$) and ($R_{m,t} \times D^{both}$). In other words, these interaction terms only consider the market returns of the times that CDS are traded.

The complete model is now:

$$R_{i,t} = \propto_i + \beta_1 . R_{m,t} + \beta_{2.} D^{sell} + \beta_{3.} D^{buy} + \beta_{4.} D^{both} + \beta_{5.}(R_{m,t} \times D^{sell}) + \beta_{6.}(R_{m,t} \times D^{buy}) + \beta_{7.}\left(R_{m,t} \times D^{both}\right) + \epsilon_{i,t}$$

of which β_5, β_6 and β_7 estimate the effect of selling CDS and/or buying CDS on the market beta. If they are positive, then the market beta increases by selling/buying CDS. If they are negative, then the market beta decreases by selling/buying CDS.

3.1B: Decomposing the Market Beta

After the results of part 1 are presented, and it indeed turns out that the beta has increased, I will decompensate this beta. (Also in this part, I will closely follow Nijskens & Wagner (2010).) This decomposition is necessary to analyze the cause of the increased beta, which could be internal or external. The beta of a stock is given by:

$$\beta_i = \frac{COV_{i,m}}{\sigma_m^2}$$

$COV_{i,m}$ is the covariance of the stock with the market return and σ_m^2 is the variance of the market. Nijskens & Wagner (2011) provide the following: If the correlation coefficient between the stock and the market is

$$\rho_{i,m} = \frac{Cov_{i,m}}{\sigma i \cdot \sigma m}$$

Then the beta equation can be rewritten as:

$$\beta_i = \rho_{i,m} \frac{\sigma_i}{\sigma_m}$$

The beta is now the product of a bank's correlation with the market and a bank's standard deviation relative to the market's standard deviation.

Any change in the variance of the bank's return indicates a change in individual risk. In theory, the variance should decrease if a bank trades CDS, because it is supposed to reduce the risk on exposures. In contrast, the correlation with the market might increase after trading CDS. An increase in market correlation indicates that banks are more dependent on each other, indicating a greater systematic risk. If indeed the variance decreases and the correlation increases, it is proven that trading CDS decreases the individual risk of banks, but increases the market risk of the financial sector.

3.2: Data

The information about the banks, who have traded CDS at least ones comes from US FDIC CALL reports. Banks were required to report their CDS exposure since September 1998 and I included all data between September 1998 and June 2006, which is the same period as Nijskens & Wagner (2010). I will not include data from July 2006 and further because the (upcoming) economic crisis will add noise into the estimations. The quarterly data of the notional amount of CDS traded will identify the quarters in which the bank started traded CDS. Many banks never stopped trading CDS after they bought or sold the first swaps. Some other banks stopped trading for a few quarters and then continued again, while a few banks bought or sold CDS randomly.

I differentiate CDS-trading banks between guarantors (the bank is selling credit risk protection) and beneficiaries (the bank is buying credit risk protection). There are 82 banks who have bought and/or sold CDS in the given time period. From these, I deleted the banks, which reported CDS exposures in all quarters, because the value of the dummies will be 1 for every observation. They will therefore not estimate any beta effect and are not useful for this research. After the remaining banks are identified, I got their daily equity returns from DataStream.

Although the time span is exactly the same as used by Nijksens & Wagner (2010), the final dataset differs from theirs. I deleted 8 more banks from the original dataset for various reasons. The final dataset contains 30 banks instead of 38. This might have small influence on the results, but it will probably not significantly affect the outcome of this research.

3.3: Descriptive statistics

In this subsection I will briefly summarize the statistics of the variables included in the regression. The means, standard deviation and the minimum and maximum values of the variables are presented in table 1below.

	Nr. of banks	Mean	Std.Dev	Min.	Max.
Ri	30	.026%	2.000%	-30.918%	19.531%
Rm	30	.013%	.750%	-3.9277%	4.752%
Ri (sell)	19	.040%	2.241%	-30.918%	19.531%
Ri (buy)	27	.027%	2.044%	-17.296%	17.001%
Ri (both)	16	.027%	1.611%	-13.231%	-18.025%

Table 1

Of the 30 banks in the sample, 19 banks reported to have CDS exposures of which they were protection sellers between September 1998 and June 2006. The number of banks that have bought CDS in this period is significantly higher: 27 banks have reported CDS exposures of which they were the protection buyers. 16 banks, just a little more than half of the sample, have bought and sold CDS at the same time.

The average daily equity return of the 30 banks is 0.026% and the average standard deviation is 2%. The financial market's average return was 0.013% each day, but the standard deviation of 0.75% is also significantly lower than the individual banks'. The average daily returns of CDS selling banks is higher than the average of all 30 banks, while the average of CDS buyers is almost equal to the average of all 30. The higher returns from protection sellers could be partly due to the premiums they received on their CDS.

4: Results

In this section I present, summarize and interpret the results of both part 1 (beta change) and part 2 (beta decomposition) of the analysis. I will also do various robustness checks to find whether the results could also be caused by other factors.

4.1: Estimating the market beta after trading CDS

The beta estimation results are summarized in table 2. Regression (a) is a simple regression between the banks´ return and the market return. Regression (b) is the regression with the interaction of the dummies D^{sell}, D^{buy} only. The interaction terms estimate, how much the beta increases of CDS are traded. Regression (c), is the final complete regression including all dummy interactions, also adding D^{both} .

Ri	**coefficient**	**95% confidence interval**		**t**
		Min	Max	
Regression a				
Rm	1.04	1.02	1.06	106.26
$\propto_i$	0.01	-0.01	0.03	1.67
Regression b				
Rm	0.91	0.88	0.94	60.64
Dsell	-0.00	-0.05	0.04	-0.16
Dbuy	0.00	-0.03	0.04	0.21
Rm.Dsell	0.04	-0.01	0.08	1.96
Rm.Dbuy	0.22	0.18	0.26	11.32
$\propto_i$	0.01	-0.01	0.03	0.95
Regression c				
Rm	0.87	0.84	0.91	53.5
Dsell	0.05	-0.02	0.12	1.42
Dbuy	0.02	-0.01	0.07	1.11
Dboth	-0.09	-0.17	-0.00	-1.99
Rm.Dsell	0.18	0.25	0.24	5.9
Rm.Dbuy	0.30	0.26	0.35	12.85
R.Dboth	-0.26	-0.35	-0.18	-6.21
$\propto_i$	0.002	-0.02	0.02	0.18

Regression (a) is the simple form of the CAPM formula: $R_{i,t} = \propto_i + \beta_1 . R_{m,t} + \in_{i,t}$, without considering CDS and any other variables. The estimated market beta is equal to 1.04 This means that the banks' returns closely follow the developments of the financial market. The banks' fixed effect is 0.01%

Regression (b) leaves only D^{both} out of the equation, because it overlaps the results of the sell and buy dummies. According to this output, selling CDS adds on average 0.04 to the market Beta of the bank, while buying CDS adds on average 0.22 to market Beta. The effect of buying credit protection is significantly higher than the effect of selling credit protection. Moreover, the left bound of the 95% confidence interval of D^{sell} indicates that it is not 95% certain that selling CDS increases the market beta. A bank that sold CDS faces a market Beta of on average 0.95, which is lower than the 1.04 from regression (a). A bank that bought CDS however, might even have a beta of 1.13. These results show that buying CDS certainly increases the market beta but selling CDS does not with 95% certainty increase the market beta. They also indicate that buying protection increases the market beta significantly more than selling protection. The fixed effect of the banks is again 0.01%

Because many CDS trading banks do not only sell or only buy credit protection, D^{both} was introduced in regression (c). D^{both} subtracts 0.26 from the sum of the effects of D^{sell} and D^{buy}, which is equal to 0.22

Introducing this variable, does not only show that the beta increases with 0.22 in case a bank does both selling and buying. It also increases the beta effect of selling and buying individually. Selling CDS now adds 0.18 to the market beta, which in total becomes 1.05 on average. Buying CDS only increases the market beta with 0.30, estimating an even higher beta of 1.17 and doing both totals 1.09. Again, buying protection increases the market beta more than selling protection. The bank's fixed effect drops to almost 0 %

In general, the estimation of the effect of trading CDS on the market beta is higher than the results of Nijksens & Wagner (2010). They found a temporary beta effect of 0.18 and a permanent beta effect of 0.06. This difference can be explained by the different interpretation of the dummies. Not just the focus on selling and buying, but mainly the consideration that banks could also stop trading CDS may have caused the difference. Also, the absence of an abnormal return variable and the omission of 8 banks may have caused difference in the results. Nevertheless, both their and my results show an increase in the market beta of CDS trading banks.

4.2: Decomposing the beta

In this section, I explain whether the increased beta is caused by a higher individual risk (bank variance relative to market variance) or a higher market risk (correlation).

Table 3 contains the number of banks of which the variance after buying or selling CDS decreased or increased and the average change in variance.

Number of banks *selling* CDS	**19**	**Number of banks *buying* CDS**	**27**
Number of banks of which the variance decreased after selling CDS	11	Number of banks of which the variance decreased after buying CDS	23
Number of banks of which the variance increased after selling CDS	8	Number of banks of which the variance increased after buying CDS	4
Average change in variance after selling CDS	-0.30%	Average change in variance after buying CDS	-2.38%

Table 3

Of the 27 banks which bought CDS, 23 had their variances decreased due to buying credit protection. On average, their variance decreased by 2.38%. By buying credit protection, banks aim to hedge the risk on their exposures and the results show that indeed, their individual risk decreased. In contrast, the aim of selling CDS protection is not to hedge risk, but to make money on the premiums paid. The results show this contrast in two ways. First, only 11 of the 19 banks have a decreased variance after selling CDS. Hence, there is no clear trend in decreased variances after selling credit protection. Second, the average decrease in variance of 0,30% is significantly lower than for CDS buying banks. In summary, buying CDS clearly decreases the variance of the banks, but selling CDS can affect the variance both ways.

Since in both cases the variance did not increase, it could not have caused the higher beta. Therefore it should be caused by a higher correlation with the market. The findings on the correlations are presented in table 4 on the next page.

The banks who bought CDS now show exactly the opposite results as for the variance: the correlation increased for 23 banks and decreased for 4 banks. These 4 banks are the same banks which also showed divergent results for the change in variance. The result for the CDS selling banks are now less divided compared to the variance; Only 2 banks got a lower correlation after selling CDS while the other 17 got a higher correlation with the market.

Number of banks *selling* CDS	**19**	**Number of banks *buying* CDS**	**27**
Number of banks of which the correlation decreased after selling CDS	2	Number of banks of which the correlation decreased after buying CDS	4
Number of banks of which the correlation increased after selling CDS	17	Number of banks of which the correlation increased after buying CDS	23
Average change in correlation after selling CDS	7.66%	Average change in correlation after buying CDS	10.7%

Table 4

The results in table 3 and 4 clearly show that the individual risk of the banks decreases particularly for protection buyers while the correlation with the market increases for both protection sellers and buyers. The nature of credit derivatives explains the decreased variance of protection buyers, because they are supposed to hedge credit risk. This is the credit risk factor, which seemed to be managed adequately if risk is calculated separately.

The higher correlation though, is not a specified characteristic of CDS contracts. This is the market risk factor, which had probably not been calculated in the overall risk assessment. Both buyers and sellers increased their market risk while trading CDS. Especially for protection buyers this was not the preferred outcome of the CDS contracts. Moreover, it might even have had the opposite effect on their total risk. Would the effects of trading CDS had been known before, or would the market risk had been considered before, then the banks would had been able to manage their overall risk related to CDS more adequately.

4.3: Robustness checks

I will now argue alternative explanations of the change in the market beta. Again, I will closely follow Nijksens & Wagner(2010) is this part.

The first alternative explanation is that the market beta increased for every bank, regardless whether they traded CDS or not. If this is true, then running the same regression with the equity returns of banks which did not trade CDS should get the same results. Because I used the same banks and time period as Nijskens & Wagner (2010), I will not run this regression myself, but consider their results to be valid for my research as well. They matched each CDS bank with its closest bank in jurisdiction in terms of asset size. The regression with the non-CDS trading banks showed a negative effect of CDS trading on the market beta. This proves, that the beta increase is only valid for CDS-trading banks.

Another possibility is that the increase of the market beta is the result of changes in the banking sector over time. In this case, there should be a general trend towards a higher market beta. To find this trend, Nijskens & Wagner (2010) estimated the beta of the MSCI World Bank (banking sector) Index with respect to the MSCI World Index (general market). This regression indicated that the banks sector's beta has been stable. This rejects the possibility that there was a general upwards trend in betas.

5: Limitations, Recommendations and Conclusion

In this section, I present the limitations of my research, which could have affected the precision of the results. I will also give various recommendations for further research, which might improve the precision of the results. Of course, this paper ends with a conclusion.

5.1: Limitations

First of all, I do not consider the notional amount of exposures outstanding, which means I do not distinguish between banks trading a lot or just a few CDS. This does not only affect the results of buying CDS and selling CDS separately, but also of the combination: If a bank bought a very large amount of CDS and sold just a small amount, then the effects of buying on the market beta would offset the effects of selling. Second, I also did not consider the size of the banks: large banks might have larger CDS exposures, and might also have more impact on the market than smaller banks.

A third limitation to this research is the absence of robustness checks for the beta decomposition part. For both the decreased variance and the increased correlation I did not do any robustness checks while these changes could also be caused by other factors. They could for instance have been caused by other financial constructions, also for non-CDS trading banks, or a general increasing/decreasing trend over time.

Finally, in contrast to Nijskens & Wagner (2010), I did not use an abnormal return dummy, which is intended to measure any abnormal return associated with the CDS event. These abnormal returns are also weighted in the estimation of the average market beta and might have small effects on this average.

5.2: Recommendations for Further Research

Both this research as well as Nijskens & Wagner (2010) study the effects of CDS trading on the market beta before the credit crisis. Since the market might be more mature now, and new insights might have changed banks' perception of CDS exposures, I recommend a similar research on a more recent time-period. Also the increasing number of banks in the CDS market might cause the results of a more recent time period to be different than before the crisis. I also recommend considering the notional amount of CDS exposures outstanding, or considering the size of the banks in further research. This might result in clearer insights on the effects of CDS trading on the market beta of different types of banks.

Since banks are not the only traders in the CDS market, I also recommend to expand this research by considering other financial entities (mutual funds, investment companies, etc.) as well. The effect of CDS on the individual and market risk of other financial institutions might increase the knowledge of the CDS market and might also point out different aspects of CDS trading.

5.3: Conclusion

In This paper I have analyzed the relationship between buying and selling credit default swaps and the market beta of banks. I have found, that the market considers banks to be riskier after both buying and selling CDS. The effect of buying CDS on the market beta was significantly higher than the effect of selling CDS. This is interesting, because the purpose of buying CDS is to decrease the risk of banks, but reality shows that their risk actually increased after buying credit protection trough CDS. I found, that the variance of the banks' returns relative to the variance of the market decreased after buying CDS, proving that it decreased their risk individually. But simultaneously, their correlation with the market increased tremendously, which means that the banks' market risk increased. In other words: By hedging the credit risk of exposures, banks transferred their individual risk into the financial sector, thereby unintentionally increasing their overall risk.

This has important implications for the overall risk management of banks. Credit risk and market risk should not be implemented differently because the overall risk will then be underestimated. Banks had failed to measure the higher systematic risk that comes with trading CDS, because they were too focused on the effects of CDS on their credit risk only.

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