Linkages Between Financial CDS Sectors: A Focus on EU-USA-UK Markets

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Master Degree in
Islamic Financial Management

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3/ Sha'aban/1437 H corresponding to /10/May/ 2016 G

Linkages Between Financial CDS Sectors: A Focus on EU-USA-UK Markets

رسالة مقدمة لاستكمال متطلبات الحصول على درجة الماجستير في الإدارة المالية الإسلامية

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جامعة عفت

جدة ، المملكة العربية السعودية
عمادة الدراسات العليا و البحث العلمي

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أعضاء لجنة التحكيم

المشرف على الرسالة
الإسم:.....
التوقيع:.....

المشرف المشارك (إن وجد)
الإسم:.....
التوقيع:.....

العضو الخارجي
الإسم:.....
التوقيع:.....

رئيسة القسم
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عميدة الكلية
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عميدة الدراسات العليا والبحث العلمي
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ABSTRACT

This study examines the dynamic relationships between the US – EU – UK five year financial CDS sector index spreads for the banking and insurance sector over the recent period which is marked by the onset of the global financial crisis. By using daily data on five-year CDS indexes from January 1, 2004 to February 2, 2015. The objective of this examination is to analyze the dynamic relationships between the US – EU – UK using 5 time varying copulas (Gaussian, Student, Gumbel, Frank and Symmetrical Gumbel). The analyses we did in this study clarify the linkage between sectorial CDS markets for USA, UK and Europe. This study also helps to understand the nature of the relation between sectors (insurance, banking) and to assess the risk exposure for both sectors banking and insurance through Islamic finance point of view.

Keywords: CDS spread, insurance, banking and finance.

DECLARATION

This work is original and has not been previously submitted in support of any degree qualifications or course.

Afnan Khoshaim

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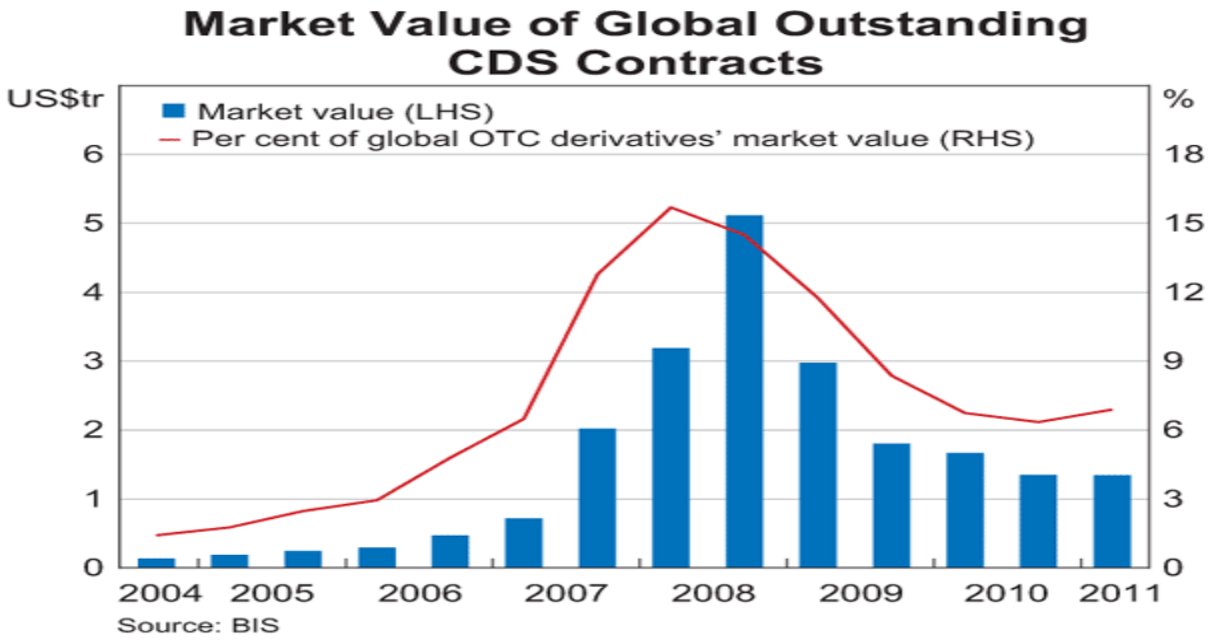
CHAPTER 1
INTRODUCTION

1.1 Background

The Credit Default Swap (CDS) market evolved as a major component of the capital markets since 1990's. It is expected to lead further market growth following the removal of current regulatory uncertainty (Basle II). Sovereign CDS are considered the most liquid derivatives in the emerging markets and therefor it's considered the focus of emerging markets. The flowing figure shows the increase in the market value of the global outstanding CDS contracts.

Figure 1: Market Value of Global Outstanding CDS Contracts



Source: BIS

It's obvious in the figure above that there has been a clear increase in the market value of CDS contracts since 2004 – 2011. The market value (LHS) reached its highest value in 2008 from less

than 1 US $ in 2004 to more than 5 US $ IN 2008. By the end of 2008, beginning of 2009 witness decline in the market value of CDS due to the global financial crisis.

1.2 Justification of the Research

In all sectors, risk management is crucial; this study will help to understand the relation between b credit default swap sectors (insurance and banking) and to try to find solution for the problems that may be faced by the study.

1.3 Problem statement

Recent financial and debt crises changed the perception of common linkages within financial sectors. Since the collapse of Lehman Brother in September 2008, the shocks increased and involved many countries such as USA, UK and Europe. Several unusual effects were observed such as the spillover effects were observed to emerge from USA to other countries, and vice-versa especially within the financial sectors.

In the light of these changes, it is important for financial economists, traders and regulators to understand which CDS sectorial market tends to incorporate credit risk related information more quickly and takes a lead over the other one.

To achieve this, the study seeks to find what is the linkage between sectorial CDS markets for USA, UK and Europe. It seeks also to focus on the awareness of the transmission mechanism of credit risk information across these markets.

1.4 Research objectives

We investigate the dynamic relationships between the US – EU – UK five year financial CDS sector index spreads for the banking and insurance sector over the recent period which is marked by the onset of the global financial crisis.

The study also pursues to understand the nature of the relation between sectors (insurance, banking) and to assess the risk exposure for both sectors banking and insurance.

1.5 Research questions

The first question to be answered is which sector tends to lead the other, that is, whether the change in American CDS market affects the change in the European CDS market or vice versa? Both of these sectors signal about the economic health of the country, however they are also very different in terms of market organization, participants and liquidity, and it may affect the speed of incorporating new information.

The second question flows from the first one: how does the relationship between banking CDS and insurance CDS change over time? Because of the recent significant changes in financial systems and countries' economies in general, the relationship is expected not to be constant over time but instead exhibit diversity.

1.6 Thesis outline

This thesis consists of seven main chapters each one of them is talking about an important part in this study. Chapter one of this study include the subject of research in addition to the introduction of the initial search and the main objective. Chapter tow is talking about what is credit default swap? , the most popular types of it and what is the point of use it? Also the global financial crisis and its relationship to the credit default swap. Chapter three summarizes the existing studies on the relationship between CDS sectors and some other studies that are related to the subject of the study. Chapter four is all about the methodology that we used in this study

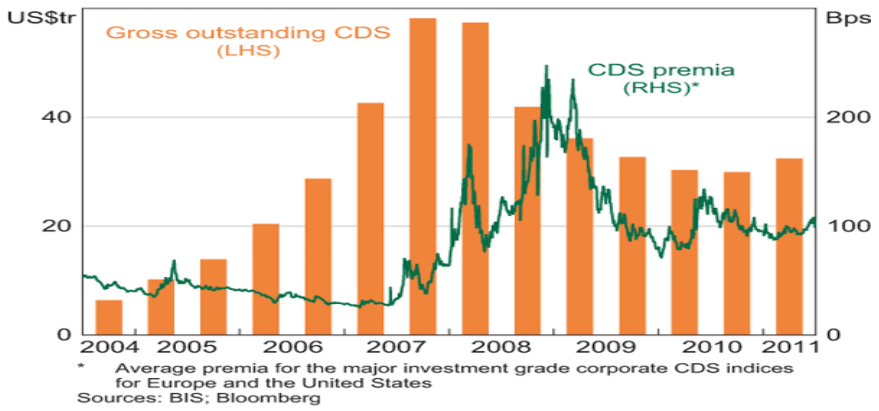
and the data description. Chapter five present the estimation of the dynamic relationship between CDS sectors (insurance and banking) in the three markets UK, US, UER. In further discusses the result that we get in chapter four. Chapter six the last chapter in this study includes the conclusion that we get from this study. Did we achieve our objectives? As well as some recommendations that could help in solving some of the problems in the global financial market.

CHAPTER 2
CREDIT DEFULT SWAP AND FINANCIAL CRISIS

2.1 Introduction

CDSs are the most important and widely used instruments in the credit derivatives market. CDS has become increasingly popular over time**.** Although most of the recent growth in credit derivative volumes has occurred among the multi-name products, single-name contracts still has the majority of gross notional amounts outstanding. Of these single-name contracts, investment-grade corporate obligations (i.e., those rated BBB- and better) comprise most of the underlying credit risk transferred as illustrated by Figure 2.

Figure 2: Gross Value of Global Outstanding CDS contracts and CDS Premia



Sources: BIS; Bloomberg

In the period 2004-2011, the market was tranquil and the gross outstanding CDS started increasing to achieve its maximum during the financial crisis of 2007. Credit default swaps heading towards a more stable system over the period 2009-2011.

2.2 Definition:

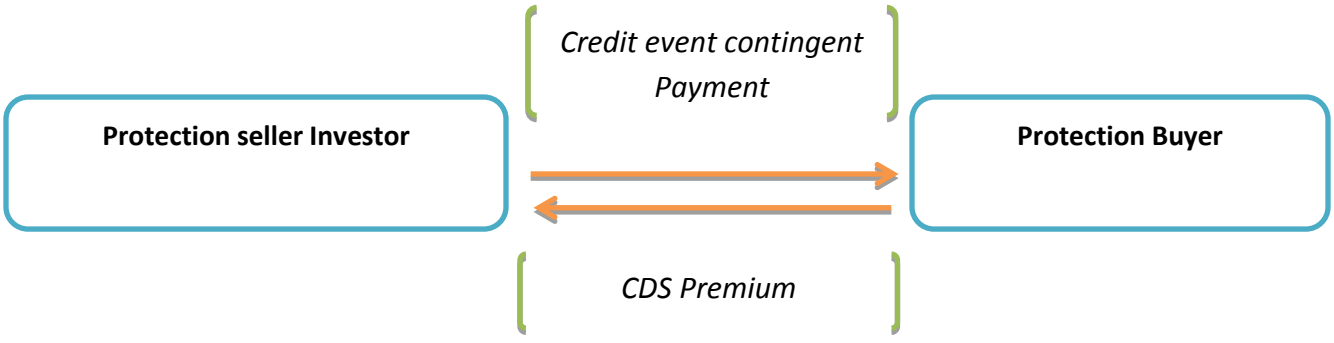
Hull and White (2000, p29) defined the credit default swap as "*Standard instruments, offering the possibility of hedging against default by the issuer of an underlying bond."*

There are different types of main credit default swaps, these are: Naked Credit Default Swaps, Basket Default Swaps, Index Credit Default Swaps and Funded Credit Default Swaps.

These are the most popular forms of CDS. But Naked CDS are under a lot of criticism, critics argue that these should be banned saying that you should not be able to buy a CDS (insurance against default) when you do not own the bond. Naked CDS are frowned upon due to them being artificial (synthetic) which then means there are no limits as to how many can be sold.

A CDS is said to be an insurance against credit risk. To understand what are the benefits and drawbacks of CDS we need to dig a bit deeper to see what a CDS involves. In a normal CDS contract, the buyer of protection transfers the risk of default of a borrower (the reference entity) to a protection seller who for a fee indemnifies the protection buyer against credit losses. The buyer of protection is hedging the risk of default of the reference entity while the seller of protection is assuming the risk of default of the reference entity. Figure 3 shows the mechanism of the credit default swap.

Figure 3 credit default swap (CDS) the basic idea



The protection seller receives a periodic premium from the protection buyer in exchange for a contingent payment if there is a credit event of the reference entity. The contingent payment is determent based on pre-specified settlement terms

2.3 Benefits of using CDS theoretically

Firstly, they are said to help complete markets and provide an effective mean to hedge and trade credit risk. However, Das, (2010) argues, *"when not used for hedging, it is not clear how CDS assists in capital formation and enhancing efficiency of markets."* It is extremely beneficial that CDS can be seen to allow risk transfer. Theoretically this is a benefit however by risk transferring, CDS also exposes firms to significant risk of losses from a breakdown in markets and also where the hedges do not work as intended due to either problems in the design of the hedge or counterparty risk.

Anderson, (2010) said that, *"these benefits can be undermined if the contract proves to be prone to manipulations or if it does not deal with counterparty risk adequately."* It can be seen that management of counterparty risk has proved insufficient, as has in some instances the settlement of contracts following a credit event. From this we can formulate an opinion that CDS can be seen to create enormous risks rather than transfer risk, it just builds it up as well as creates systemic risk. Rama, (2010) said however, *"A CDS market where all major dealers participate in a central clearing facility with adequate reserves can actually contribute to mitigating systemic risk".* However theoretically can a perfect CDS market exist so to mitigate this systemic risk.

Das, (2010) argued that, because of the example given by the Fannie Mae and Freddie Mac, "*it poses questions on the effectiveness of CDS contracts in transferring risk of default*".

Secondly, CDS allow financial institutions to better manage their exposures and investors benefit from an enhanced investment universe. Das, (2010) quotes, *"...enhancing investment and borrowing opportunities whilst reducing transaction costs." Das, (2010).* This leads us to believe that theoretically it lets us believe that it gives people as well as organizations more options to borrow and invest money.

Also, it can be seen that, CDS claims to improve market liquidity. It is generally assumed that speculative interest assists in enhancing liquidity and lowers trading costs. However, when the liquidity comes from leveraged investors, the additional systemic risk from the activity of these entities has to be balanced against potential benefits. The current financial crisis can be seen to highlight this.

Finally one of the theoretical benefits of CDS is that the CDS spreads provide a valuable market-based assessment of credit conditions. It has been argued that by using CDS, Stulz, (2010) "enabling the trading of specific risk, they help make financial markets more efficient and transparent in price discovery and increase liquidity." Stulz, (2010.) . However Stulz then goes on to mention that, "market for CDS was being manipulated." Stulz, (2010) This could mean that the benefits were then being outweighed in the practical world.

2.4 Caveats to CDS

Credit Default Swaps theoretically claim to improve the efficiency of credit pricing and show credit ratings of companies and governments. However in real life, it is not clear whether this is actually the case in practice.

Credit default swaps were initially intended as instruments for hedging and managing credit risk as mentioned. However recently they have been singled out as being detrimental to financial stability in the recent crisis.

The recent crisis has revealed several shortcomings in CDS market practices and structure. Firstly, we look at the lack of information on the whereabouts of open positions as most CDS contracts are privately negotiated contracts and do not need to be stated to anyone so therefore create hidden liabilities that do not appear in the financial statements. A practical shortcoming with CDS is that currently there is no legislation or regulations on the CDS market. This needs to be altered in order to prevent manipulation and harm to global economies.ng

Das (2010) stated that, "CDS contracts may in turn encourage moral hazard in institutions encouraging them to take on more risk on the assumption that the additional risk will be transferred or hedged". This gives companies a false impression as they take on more risk still assuming that this risk is transferred therefore having significant amounts of risk which is dangerous.

3. FINANCIAL CRISIS AND CDS

The recent crisis has revealed several shortcomings in CDS market practices and structure. Lack of information on the where a bouts of open positions as well as on the extent of economic risk borne by the financial sector are partly to blame for the heavy reactions observed during the crisis. In addition, management of counterparty risk has proved insufficient, as has in some instances the settlement of contracts following a credit event.

3.2 Opinions around the effect of CDS

As a financial innovation on the current debt crisis vary there are two main opinions regarding this matter that need to be mentioned and taken into consideration. CDS have negative or positive influence on current debt crisis.

3.3 CDS negative influence on current sovereign debt crisis

The opinion that supports the idea of "negative impact of CDS on debt crisis" reasons that CDS made crisis situation worsen as it accumulated and magnified the risk instead of doing the risk avoiding or hedging function. It was clear that there was a lot of credit involved and profits that by far exceeds the actual value of underlying assets. Buti, (2009) mentioned that "*Financial institutions were induced to finance their portfolios with less and less capital. The result was a combination of inflation of asset prices and an underlying (but obscured by securitization and credit default swaps) deterioration of credit quality. With all parties buying on credit, all also found themselves making capital gains, which reinforced the process. Buti,(2009).* The negative effect of CDS in practice which is opposing to the beneficial theoretical claim arises from the fact that when an entity is about to default there is more CDS activity on this reference entity in the form of a gambling more than insurance or hedging technique. All the CDS activity just emphasis and hope that the reference entity is going to default. This actually increases the amounts of investments made on the CDS for the possibly defaulting reference entity, that in the case of the reference entity actually defaults the protection seller will suffer a huge loss along with the reference entity. Rama, (2010) mentioned that "*The credit default swap enables to take a speculative short position that benefits from a deterioration of the issuer's creditworthiness. The sheer volume of the CDS market indicates that a substantial portion of contracts are*

speculative; in principle, the outstanding notional of credit default swaps may even become larger than the total debt of the reference entity." Rama,(2010).

From this perspective we can see that credit default swaps have been misused in the real world leading to a more risky situation that actually keeps magnifying as the protection seller will try hedging its risk by involving and sharing it with other entities, and thus the result of a default of the reference entity and the huge money that has to be paid to the CDS buyers, a systematic risk exists, causing a financial crisis. For these reasons there is a part of those who support this opinion call for the ban for at least the speculative part of credit default swaps as they harm economies.

3.4 CDS positive influence on current sovereign debt crisis

Supporters of the positive influence of CDS on the current sovereign debt crisis argue on various points that they think are valid justification for the use of CDS. The first argument is that CDS have a positive effect on the marketplace in terms of increasing the liquidity of the market, helping to make it more efficient. Stultz, (2010) argued this by saying " *A possible reason why banks' use of credit default swaps to hedge is limited is that, while the credit default swap market is typically quite liquid for large companies "Stultz,(2010).* Efficiency in this argument can be seen under the assumption of the absence of CDS buying and selling, CDS would put banks that pursue hedging in a tough situation. Stultz, (2010) mentioned that *"The ability of banks to hedge loans that they make also has benefits. For example, banks can keep lending to firms with which they have close relationships, even when they have already lent large amounts, because they can limit their risk exposure to such firms through the use of credit default swaps." Stultz,(2010).* Also the speculation aspect in CDS helps to make the market place more competitive by making the hedging prices as low as possible for banks that seek hedging.

The second argument is that CDS act a benchmark of the reference entity creditworthiness especially in if the reference entity is under financial stress, in the sense of giving credit rating to this entity, thus allowing for the market information to be shared in a more unbiased way between borrowers and lenders, in this sense it would produce less transaction costs. Jenkinson, (2008) *stated that "Many investors had, of course, also delegated their monitoring responsibility to credit rating agencies. This offered, potentially, a very significant efficiency gain. Rather than many investors paying privately to be moderately informed– with corresponding substantial replication of investment analysis – credit rating agencies were paid to be well-informed and to make this information public" Jenkinson, (2008).*

This argument supports the idea of efficient market which is a positive thing if applied to the sovereign debt crisis, as the CDS acted as an alerting signal to the countries that are a facing possibility of default and putting more pressure on their governments to try to find a solution to stop this from happening. Austin & Miller, (2011) mentioned that " *CDSs may more usefully indicate sovereign default risks for countries with more immediate fiscal challenges, such as Greece and Portugal, where sovereign default risks may be more salient due to higher levels of fiscal stress, or for larger European economies, such as Italy and Spain, which have recently come under increased fiscal stress*." *Austin & Miller, (2011).*

3.5 Conclusion

To sum up, credit default swap did have both negative and positive impact on the current sovereign debt crisis. However, the negative impact of the CDS has been more apparent as the CDS practical application came out of course when compared with the theoretical part, where a perfect world was assumed and the benefit of the society would be more favored over the benefit

of individuals and organizations. In practice, the financial world moves based on the pure benefit of individuals involved in the process rather than the entire economy.

Credit default swaps are complex financial instruments that can do both benefit and harm to entities, economies, and even the entire world, as the world is almost interconnected financially. Credit default swap need to be managed and adjusted by governments in a way that would make them serve the purpose they were for made -hedging risk- rather than being a speculative tool. In this regards, the American government and Euro-zone countries governments are working continuously to find the best legislative way to help restore balance in the financial world.

CHAPTER 3
LITERATURE REVIEW ON CDS MARKETS

This chapter summarizes the existing studies on the relationship between sectorial CDS banking and insurance sectors and some other studies that are related to the subject one way or another.

3.1 Study on sovereign CDS:

Tellalbaşı and Baysal (2013) Studied the risk structural of European sovereign credit default swap before and after in European periphery counties. The objective is to study the sovereign CDS spreads during the financial crisis of 2008-2012 for countries like Ireland, Italy, Portugal and Spain. This study proved that there is a correlation between equity index and volatility index and CDS spreads. Furthermore; they want to identify the determinant of CDS spreads using regression analysis (ordinary least square) of spread. They found that the larger the spread the higher the crisis for those countries. The mentioned countries have been suffering from the financial countries and bankruptcy. The result that this study came up with that there is a positive relationship between VIX index and CDS spreads, S&P 500 equity index, and CDS spreads and MSI world finance index and CDS spreads.

In another hand they found a negative relationship between European interest rate swaps and CDS spreads. Factors or detriments like MSCI world financial index, S&P 500 volatility index, FTSE world Europe index and S&P 500 equity index have a strong positive correlation between then and sovereign CDS spreads except for S&P 500 equity index.. The effect of risk premium on CDS spreads is linked with micro economic and financial market development. This

circumstances lead to changes in the investor's appetite which had damaged micro economic factors such as GDP, debt to GDP ratio and growth rate.

3.2 Studies on banking, insurance and financial services:

Lahiani, Hammoudeh and Gupta (2014) Studied linkages between financial sector CDS spreads and macroeconomic influence in nonlinear setting. This study aims to investigate two main factors asymmetric and nonlinear transmission of prices to CDS spreads for three sectors (banking, financial services and issuance) in the short and long run.

The methodology they used in this study is based on the use of the extended ARDL model. They collect the data monthly for five years for CDS spreads for three financial sectors (banks, financial services and insurance). They have two kinds of variables; a response variable such as the time series of the three sectors of CDS index and shock variables such as libor, Treasury bill rate, the federal funds rate, S&P equity index implied volatility index and WTI crude oil future crisis.

The findings of this study are very important for policy makers who deal with credit risk at the sector level. They find that the federal funds rate and the Treasury bill rate have a symmetric effect on CDS index in the short and long run. In the short run they positive and negative shock to VIX to be transmitted asymmetrically to insurance sector, CDS index and symmetrically for banking and financial service sector.

However, the WTI doesn't have any effect on the short run of the CDS of the banking and financial services sector. The WTI doesn't move easily in the short run. Libor rate has positive and negative changes in the three sectors symmetrically. Investors must think of libor, federal funds rate, Treasury bill rates and VIX as drivers of the financial sector CDS spreads. Nonlinear modeling is crucial in studying of financial energy variables to the sensitivity of these three

sectors CDS spreads due to that it allows for quantifying the transmission of positive and negative shocks to those variables.

Hammoudeh, Bhar and liu (2011) Studied relationship between financial sectors CDS spreads and other gauges of risk: Did the great recession change them? The objective of this study is to discern how banking, financial services and insurance inter relate each other through CDS spreads. This object will be done by studying to periods the 2008 great rescission and 2009 recovery. In addition to evaluate the impact of QE1 (QUANTITATIVE EASING) on the second period they used daily time series data for the five years CDS sector index (insurance sector, banking and financial services). In addition to that they took (bank risk premium, bank liquidity premium, and corporate default risk and ten years inflation expectations over the period 2004-2010. They collected all the data from data stream. The methodologies they use in this study are time series and as well as (var, f test, WALD test, LR test, VEC models).

They used (AIC) and (SBC) to determine the var and configurations specifications and the lag lengths. They demonstrated that the own and cross affect among all the CDS and other risk measures, especially the financial CDS spreads are significant and contagious during all the period of the study. In the first period 2007 the financial system has become less stable but in the second period 2009 risk became less but at the same time there was inflation. The bank CDS index play a major rule on non CDS risk types including the credit default and bank risk premium and there long run inflation expectations. Banks, corporate default risk premium and insurance came second after the financial services CDS index.

The insurance CDS index had the lower effect on other CDS as well as other type of risk. Government (central bank and others) have to keep in mind that risk is strong and contagious and

could move to other sectors. The financial sector went through QE1 and QE2 found that the regulatory authorities should recognize and keep on mind the relationship between their policy action and financial stability are related to the behavior of the financial CDS sector and related to other measure of risk.

Arora, Gandhi and Longstaff (2010) Studied counterparty credit risk and the credit default swap market. This study is for how to price the CDS through taking 14 different entities that dealing with the same CDS. They take across sectional data. They also examine how the CR is affecting the price of the CDS. Also that the CR priced is very high in the CDS market. After the scandal of Lehman brothers the investors on the market didn't take and precautions in their financial dealing. Instead they continue the same way they were. The CDS should be priced based on financial companies but what happened is the opposed. To be able to do this you have to have a full trust on those companies that they will never go through bankruptcy. They studied the difference in prices the fourteen entities for five years for 125 corporations widely followed CDX index. They also mentioned and studied all the companies that go through bankruptcies. They also study that concept that one bank insured in another bank and what it did to the market. In their methodology they estimate a regression model as well as t-statistics based on heteroskedastic-consistent estimate of the covariance matrix.

CHAPTER 4
METHODOLOGY AND DATA DESCRIPTION

This chapter introduces the methodology of the study, the model and the data description.

4.1. Methodology:

CDS spreads and systemic financial risks require dynamic copulas. In this study we will use time-varying (TV) copulas such as Gaussian, Student, Gumbel, Frank and Symmetrical Gumbel. CoVaR will be used to assess the systemic risk. To emphasize the systemic nature of risk measure, we add to existing risk measures the prefix "Co" which stands for conditional, contagion, or co-movement. We focus primarily on CoVaR, where institution's CoVaR relative to the system is defined as the VaR of the whole financial sector conditional on institution i being in distress. The difference between the CoVaR conditional on the distress of an institution and the CoVaR conditional on the "normal" state of the institution, DeltaCoVaR, captures the marginal contribution of a particular institution (in a non-causal sense) to the overall systemic risk.

There are several advantages to the DeltaCoVaR measure. First, while DeltaCoVaR focuses on the contribution of each institution to overall system risk, traditional risk measures focus on the risk of individual institutions. Regulation based on the risk of institutions in isolation can lead to excessive risk-taking along systemic risk dimensions.

4.1.1. Copula

Let $\boldsymbol{X}=(X_1, ..., X_n)$ be the random vector of the n risk factor log-returns which affect portfolio value, with marginal cumulative distribution functions (C.D.F.) $F_1, ..., F_n$. The multivariate C.D.F., $\boldsymbol{F}(\boldsymbol{x}_1,\ldots,\boldsymbol{x}_n) = \boldsymbol{P}[\boldsymbol{X}_1 \le \boldsymbol{x}_1,\ldots,\boldsymbol{X}_n \le \boldsymbol{x}_n]$, completely determines the dependence structure of random returns $X_1, ..., X_n$. However, its analytic representation is often too complex, making practically impossible its estimation and consequently its use in simulation models. The most common methodologies for measuring multivariate risk use the multivariate conditional Gaussian distribution due to its easy implementation. Unfortunately, empirical evidence underlines its inadequacy in fitting real data. The use of copula function allows us to overcome the issue of estimating the multivariate C.D.F. by splitting it into two parts:

- determine the margins $F_1, ..., F_n$, representing the distribution of each risk factor; estimate their parameters fitting the available data by Maximum Likelihood.
- determine the dependence structure of the random variables $X_1, ..., X_n$, specifying a meaningful copula function.

4.1.2. Sklar Theorem

Olivier P. (2012) studied the Sklar throrem (1959) and defined an n-dimensional copula is a multivariate C.D.F., $\boldsymbol{C}$, with uniformly distributed margins on [0,1] ($\boldsymbol{U}(0,1)$) and the following properties:

1. $\boldsymbol{C}$: $[0,1]^n \rightarrow [0,1]$;

2. $\boldsymbol{C}$ is grounded and n-increasing;

3. $\boldsymbol{C}$ has margins $\boldsymbol{C_i}$ which satisfy $\boldsymbol{C_i}(u) = \boldsymbol{C}(1, ..., 1, u, 1, ..., 1) = u$ for all $u \in [0,1]$.

Sklar's Theorem is the most important theorem regarding to copula functions and states that:

Let F be an n-dimensional C.D.F. with continuous margins F_1, ..., F_n. Then F has the following unique copula representation (canonical decomposition):

$$\boldsymbol{F}(\boldsymbol{x}_1,\ldots,\boldsymbol{x}_n) = \boldsymbol{C}(\boldsymbol{F}_1(\boldsymbol{x}_1),\ldots,\boldsymbol{F}_n(\boldsymbol{x}_n))$$

The theorem of Sklar (1959) is very important, because it provides a way to analyse the dependence structure of multivariate distributions without studying marginals distributions.

Referred to Sklar's theorem, copulas provide greater flexibility in that they allow fitting any marginals to different random variables, and these distributions might differ from one variable to another. Moreover, copulas provide greater flexibility in that they allow a much wider range of possible dependence structures.

4.1.3. Time-Varying Copulas

In this study we use 5 time varying copulas (TVP- Gaussian, TVP- Student, TVP- Gumbel, TVP-Frank, and TVP- S.Gumbel). These copulas are characterized by their dependence structure and all of them are parametric.

4.2. Marginal distributions:

In this paper, we use Exponential GARCH model because the standard GRACH models assume that positive and negative error terms have a symmetric effect on the volatility. In other words, good and bad news have the same effect on the volatility in this model.

Negative returns imply a larger proportion of debt through a reduced market value of the firm, which leads to a higher volatility. The risk, i.e. the volatility reacts first to larger changes of the market value, nevertheless it is empirically shown that there is a high volatility after smaller changes.

4.3. Copula-CoVaR method

This paper employs the modified version of CoVaR propose by Girardi and Ergun (2013) . As the definition of CoVaR shown, the key to compute CoVaR is to find the conditional probability distribution function.

The main advantage of copula is that it could allow separately modelling the margins and dependence structure, which is essential for the computation of CoVaR, because mis-specified marginal model would result in wrong information for copula.

Copula could capture more dependency information than traditional dependence measure given by linear correlation coefficient, especially when the joint distribution is not elliptical. Finally, Copula-based CoVaR is computationally more tractable than CoVaR proposed by Girardi and Ergun (2013) .

4.3.1. Multivariate CoVaR

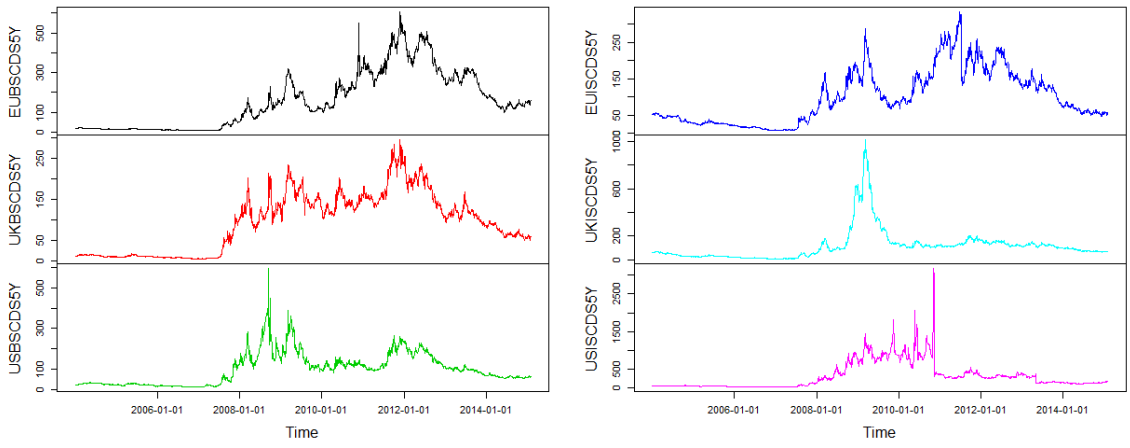
Another advantage of copula-based CoVaR is the convenience to be extended to higher dimension case to quantify more possible risk situations. Simulation will be implemented to study the properties of CoVaR. We estimate CoVaR and ΔCoVaR under different margins and copula specification, and investigate the correlation of CoVaR and ΔCoVaR with dependence parameter to guarantee the accuracy of the interpretation of CoVaR and ΔCoVaR. CoVaR and

Copula dependence designed as a systemic risk index, CoVaR should be negative correlated with copula dependence.

4.4. DATA

We use daily data on five-year CDS indexes[1] for the US, Europe and United Kingdom and for two financial sectors (banking and life insurance), ranging from January 1, 2004 to February 2, 2015. The data, plotted in Figure 4, shows that all CDS indexes exhibited bursts after Lehman Brothers collapsed (September 2008) and the financial crisis started.

Figure 4 Banking and Insurance Sectors CDS 5 Y for Eurobe, UK and USA



The figure above is for banking and insurance sectors CDS 5 years for Europe, UK and USA. We split the data into two subsample periods[2]: before and after the onset of the US

[1] All data are sourced from DataStream

[2] The Bai and Perron (2003) testing procedure that examines the null hypothesis of no structural change against the alternative of multiple unknown breaks was applied to the US banking CDS indexes over the period from January 2007 to December 2008. Our results indicate one structural break on 11th of September 2008.

subprime crisis. The pre-crisis period ran from 1 January 2004 through 10 September 2008 and the post-crisis period from 11 September 2008 to 02 February 2015. In the pre-crisis period both indicators for banking and insurance had the same stable trend. After the crisis, the trend started to see clear spikes.

CHAPTER 5
RESULTS AND FINDINGS

This chapter presents the estimation of the dynamic relationship between CDS sectors (insurance and banking) in the three markets UK, US, UER. In further discusses the result that we get in chapter five.

5.1. DESCRIPTIVE STATISTICS

The return series are obtained by using the logarithmic differences of the CDS spread values expressed in percentage. Basic characteristics of the data in the pre-crisis and post-crisis periods have been summarized in Table 1. This table reports descriptive statistics for the return series in the pre-crisis and the post-crisis periods.

Table 1: Summary statistis of CDS index spreads

Panel A : Pre-crisis						
	EUBCDS	**UKBCDS**	**EUICDS**	**UKICDS**	**USICDS**	**USBCDS**
Min	-19.758	-23.495	-19.144	-17.268	-27.010	-23.231
Mean	0.160	0.203	0.053	0.035	0.173	0.255
Max	27.113	35.775	52.202	26.987	26.781	33.227
Std Dev.	3.322	4.814	3.815	3.614	3.817	4.457
Skewness	1.021	0.351	2.122	0.700	0.299	0.716
Kurtosis	11.841	6.137	31.560	6.232	8.439	9.200
Q12	120.017*	34.861*	62.536*	72.794*	98.117*	72.787*
Q12^2	307.831*	244.889*	110.452*	184.036*	518.311*	384.955*
JB	7393.788*	1955.108*	51899.904*	2090.688*	3666.517*	4439.873*

ARCH(12)	176.809*	125.362*	76.753*	93.298*	254.453*	163.413*
Panel B : Post-crisis						
Min	-33.259	-46.731	-79.325	-20.358	-230.224	-64.646
Mean	0.013	-0.050	-0.034	-0.017	-0.049	-0.126
Max	38.104	22.666	24.942	24.627	86.516	53.985
Std Dev.	3.489	3.693	4.053	2.926	8.008	4.771
Skewness	0.052	-1.317	-4.608	0.426	-14.838	-1.392
Kurtosis	22.808	20.898	91.319	9.040	432.613	42.920
Q12	80.501*	55.112*	39.920*	62.264*	97.084*	100.327*
Q12^2	585.999*	125.647*	0.689	123.524*	29.197*	640.065*
JB	36254.562*	30919.154*	586927.073*	5748.443*	13099971.116*	128894.542*

Panel C : whole period						
	EUBCDS	**UKBCDS**	**EUICDS**	**UKICDS**	**USICDS**	**USBCDS**
PP	-46.84	-51.43	-47.73	-48.7	-49.72	-48.72
KPSS ct	0.165**	0.147**	0.153**	0.192**	0.077	0.079
Q12	130.251*	44.653*	63.886*	118.989*	133.248*	127.120*
Q12^2	895.618*	354.881*	12.522*	338.283*	50.955*	1068.233*
JB	42600.968*	17212.558*	591975.496*	7425.632*	37056608.147*	116658.934*
ARCH	494.529*	184.487*	10.992*	176.961*	50.574*	614.193*

PP test with constant for unit root (fails to reject H0 there is a unit root for all series) and KPSS stationarity tests with constant and trend reject the null that the series are I(0) at 5% level except for US.

The standard deviation that measures the risk in the banking and insurance sectors in the three countries shows that there is a difference in the pre and post crisis eras. In the pre-crisis the changes are minimal in comparison with the post crisis. The biggest changes in the post crisis are in the US insurance sector as highlighted in the above table.

All series present significant kurtosis and all the Jarque-Bera tests reject the normality. The ARCH LM test indicates the series are suitable for ARCH type modeling. Standard deviation of the CDS spreads for US and Europe is especially high during the post-crisis period.

We conducted the Phillips-Perron (PP) unit root test and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) stationarity test for all sector CDS indexes and found that they all have unit roots, and thus are *I(1)*.

5.2. Unconditional correlation

The Pearson correlation coefficients between CDS spread indexes for the two sub-periods are reported in Table 2. The CDS indexes of the banking and insurance sectors within the same country show higher positive correlation. These coefficients remain higher after the onset of the financial crisis, except for the US.

Table 2 Unconditional correlation (The lower triangular matrix reports the correlation coefficient in the pre-onset period and the upper triangular matrix shows the correlation coefficient in the post-onset period**).**

	EUBCDS	**UKBCDS**	**EUICDS**	**UKICDS**	**USICDS**	**USBCDS**
EUBCDS	1.000	0.656	0.655	0.576	0.148	0.292
UKBCDS	**0.587**	1.000	0.603	0.616	0.187	0.354
EUICDS	0.688	**0.444**	1.000	0.687	0.189	0.295
UKICDS	**0.528**	**0.374**	**0.667**	1.000	0.180	0.235
USICDS	0.452	0.324	0.418	0.387	1.000	0.193
USBCDS	0.358	0.288	0.334	0.281	0.528	1.000

The Pearson correlation coefficients between CDS spread indexes for the two sub-periods are reported in Table 2. The CDS indexes of the banking and insurance sectors within the same country show higher positive correlation. These coefficients remain higher after the onset of the financial crisis, except for the US.

5.3. Estimation of Copula parameters

Table 3 presents the estimates for copula models in the period before crisis onset. Bank and Insurance CDS vs. USBCDS.

Table3. Parameters Estimates of the TV Copulas

	EUBCDS	**UKBCDS**	**EUICDS**	**UKICDS**	**USICDS**
TVP-Gaussian Ψ_0					
Ψ_1	-1.133	-0.717	-1.178	-1.155	-0.909
Ψ_2	0.389	0.107	0.337	0.423	0.927
AIC	-90.600	-63.130	**-100.390**	-61.143	-272.681
TVP-Student Ψ_0	0.672	0.158	0.709	0.189	0.577
Ψ_1	-0.813	1.265	-0.782	1.094	0.174
Ψ_2	0.270	0.089	0.265	0.119	0.541
N	8.883	13.696	12.765	8.397	7.644
AIC	**-99.556**	**-70.356**	-97.906	-69.040	**-290.316**
TVP-Gumbel $\bar{\omega}$	-0.896	-1.633	-0.779	-2.810	-0.153
$\bar{\beta}$	0.294	-0.022	0.374	-0.698	0.465
$\bar{\alpha}$	-0.114	-1.189	-0.915	-1.280	-1.499
AIC	-86.573	-54.016	-89.973	-56.463	-267.295
TVP-Frank $\bar{\omega}$	0.310	0.104	0.655	0.826	1.411
$\bar{\beta}$	0.349	0.904	-0.129	-0.329	-0.270
$\bar{\alpha}$	-0.246	-0.255	-0.703	-1.349	-2.619
AIC	52.106	294.794	164.259	**-79.392**	110.979
TVP-Joe $\bar{\omega}$	-1.878	0.035	-1.441	-3.395	0.012

$\bar{\beta}$	-0.725	0.863	-0.060	-0.911	0.802
$\bar{\alpha}$	-6.563	-1.615	-2.616	-3.143	-1.124
AIC	-66.262	-37.649	-65.321	-40.563	-223.986
TVP- S. Gumbel	-2.024	-0.796	-0.983	-0.326	0.731
$\bar{\beta}$	-0.843	0.471	-0.890	-0.186	-0.623
$\bar{\alpha}$	-3.563	-0.660	-8.383	-7.270	-9.978
AIC	-86.157	-59.698	-81.945	-59.597	-252.560

Table 4: Estimates for copula models in the period after crisis onset. Bank and Insurance CDS vs. USBCDS.

Parameters Estimates of the TV Copulas

		EUBCDS	**UKBCDS**	**EUICDS**	**UKICDS**	**USICDS**
TVP-Gaussian	Ψ_0	2.532	2.404	1.869	1.841	1.787
	Ψ_1	-2.730	-2.613	-2.007	-2.260	-1.921
	Ψ_2	0.108	0.135	0.606	0.226	0.752
AIC		-500.039	-467.722	-492.904	-337.442	-533.659
TVP-Student	Ψ_0	0.230	0.600	0.273	0.295	0.325
	Ψ_1	1.714	0.983	1.615	1.447	1.494
	Ψ_2	0.060	0.072	0.127	0.054	0.155
	N	7.079	6.319	8.291	6.810	5.756
AIC		**-554.563**	**-520.361**	**-545.659**	**-380.339**	**-614.199**
TVP-Gumbel	$\bar{\omega}$	-0.207	-0.173	0.051	-0.002	0.334
	$\bar{\beta}$	-0.082	0.100	0.024	-0.247	-0.157
	$\bar{\alpha}$	-2.483	-2.233	-3.305	-5.195	-5.084
AIC		-495.655	-455.245	-493.779	-340.283	-581.417
TVP-Frank	$\bar{\omega}$	1.814	0.966	1.229	0.099	0.446
	$\bar{\beta}$	-0.850	0.074	-0.947	0.702	0.693
	$\bar{\alpha}$	-1.593	-1.256	0.641	0.317	-0.924
AIC		-541.920	-333.326	-411.689	-318.818	-532.082

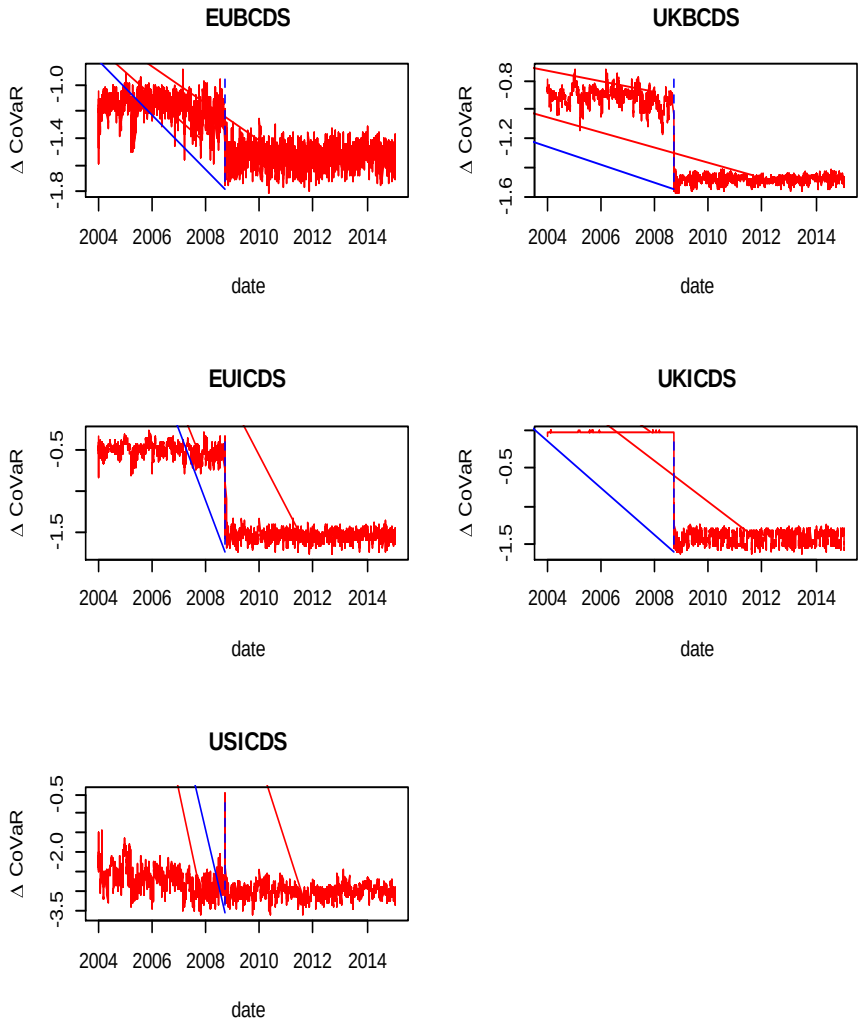
TVP-Joe	$\bar{\omega}$	-0.528	-0.387	-0.244	-0.414	0.382
	$\bar{\beta}$	0.007	0.074	-0.065	-0.165	-0.269
	$\bar{\alpha}$	-2.227	-2.867	-3.948	-4.747	-7.789
	AIC	-384.121	-339.242	-382.776	-255.419	-455.764
TVP-S.Gumbel	$\bar{\omega}$	-0.300	0.077	0.152	-0.209	1.123
	$\bar{\beta}$	0.004	0.127	-0.210	-0.150	-0.671
	$\bar{\alpha}$	-1.561	-3.095	-4.515	-3.736	-10.323
	AIC	-487.202	-481.871	-476.914	-332.381	-585.830

The above two tables are the copula model in the before and after crisis periods. In the period before the crisis Table 3, the TVP-Student parameter gave the best estimate for (EUBCDS, UKBCS, and USICDS). The EUICDS best estimate was in the TVP-Gaussian parameter while the UKICDS best estimate was in the TVP-Frank parameter. In the period after the crisis, all CDS in both sectors were estimated the best in TVP-Student as shown in Table 4.

5.4. INTERACTIONS BETWEEN SECTORIAL FINANCIAL CDS MARKETS

In this section we study the linkages between sectorial CDS markets. The figure below illustrates the effects of a collapse in one market to others. The collapse of US Banking market on all other markets (Banking and Insurance).

Figure 5: Delta CoVaR for UK, USA and EU CDS Markets



From the figure above, we can understand the burden effect on UK sectorial markets and the EU insurance market. For the linkage between US banking and Insurance, the nature of the impact before and after the financial crisis remained unstable given the strong relationship between two sectors. The collapse of US banking sector was transferred to Europe rather than US market.

To understand more these linkages, the following tables summarize the ranking of these markets before and after the financial crisis based on the estimation of Copula-CoVaR model.

Table 5: Statistics summary of estimated copula-based delta CoVaR before crisis onset

	EUBCDS	**UKBCDS**	**EUICDS**	**UKICDS**	**USICDS**
Mean	-1.169	-0.916	-0.516	-0.012	-2.695
Std.	0.105	0.068	0.087	0.003	0.348
Max	-0.886	-0.720	-0.283	-0.001	-1.447
Min	-1.590	-1.176	-0.833	-0.068	-3.596
Rank[3]	2	3	4	5	1

Table 6: Statistics summary of estimated copula-based delta CoVaR after crisis onset

	EUBCDS	UKBCDS	EUICDS	UKICDS	USICDS
Mean	-1.537	-1.486	-1.536	-1.419	-3.021
Std.	0.092	0.032	0.103	0.090	0.234
Max	-1.176	-1.169	-0.352	-0.951	-0.450
Min	-1.806	-1.575	-1.758	-1.634	-3.637
Rank	**2**	**4**	**3**	**5**	**1**

There are several advantages of using the DeltaCoVaR measure. First, while Delta CoVaR focuses on the contribution of each institution to overall system risk, traditional risk measures focus on the risk of individual institutions. Regulation based on the risk of institutions in isolation can lead to excessive risk-taking along systemic risk dimensions.

We can note from the ranking of estimated copula-based delta CoVaR in table 6 that there is direct relation between all financial markets, also we can clearly see that USICDS was the worst one of them all due to the direct relationship with the US banks, which were the first and the

[3] Rank is the rank of mean by increasing order

most affected by the global financial crisis. Because of the strong relationship that binds the global financial markets to each other the fall of the US market led to the fall of the rest of the global financial markets, respectively. EUBCDS came in the ascend place after the USICDS then it comes the other markets, respectively, as shown in the table above. The ranking are the same in both pre and post crisis except in the UKBCDS and EUICDS.

After analyzing the data we can say that both sectors (banking and insurance) were affected by the global financial crisis in all the markets (US –EU – UK). But we can say that the most affected sector by the global financial crisis is the US insurance sector. The collapse that happened in the insurance sector in the US market led to the collapse of the rest of the financial market eventually. The following chapter gives an overall conclusion of this study as well as recommendation.

CHAPTER 6
Conclusion and Recommendations

6.1. Conclusion

We investigated the dynamic relationships between the US – EU – UK five year financial CDS sector index spreads for the banking and insurance sector over the recent period which is marked by the onset of the global financial crisis.

In this study we used 5 time varying copulas (Gaussian, Student, Gumbel, Frank and Symmetrical Gumbel). These copulas are characterized by their dependence structure and all of them are parametric. We needed to understand the nature of the relation between sectors (insurance, banking) and to assess the risk exposure for both sectors banks and incurrence.

The recent financial and debt crises changed the perception of common linkages within financial sectors. Since the collapse of Lehman Brother in September 2008, the shocks increased and involved many countries such as USA, UK and Europe. After the analyses we can say that the linkage between sectorial CDS markets for USA, UK and Europe is now clear and all of these markets are tied together. We can also say that both sectors (insurance, banking) are related to each other with a direct relation where the banking sector tends to lead the insurance sector. The change happened in American CDS market affect the European CDS market is the biggest proof of that. Due to the strong relationship that binds the global financial markets to each other the fall of the US market led to the fall of the rest of the global financial markets, respectively.

Both of these sectors (insurance, banking) affect the economic health of the countries and it touch the speed of incorporating new information. the recent significant changes in financial

systems and countries' economies in general make the relationship between banking CDS and insurance CDS exhibit diversity.

6.2. Recommendation through Islamic finance point of view

"Derivatives are financial weapons of mass destruction, mainly due to opaque pricing and accounting policies in swaps, options and other complex products whose prices are not listed on exchanges…" – Warren Buffet

"…that there is nothing wrong with financial engineering, but that the poor uses (of derivatives) are to blame is akin to the argument against gun control that „guns do not kill people, people kill people"… (there will be) misuse of financial instruments which they create for hedging, but which are in fact instruments of gambling." – Prof. Mahmoud El-Gamal

The detrimental role of CDSs in the occurrence and proliferation of 2008 financial crisis and the relative survival of Islamic financial institutions shed the light on the viability of and level of safety provided by Islamic finance. This is due to the fact that the financial institutions adopting Islamic finance principles and transactions had safely passed the financial crisis with minimum losses. This is due to the fact that Islamic finance principles immunize the financial sector against the toxicity of derivatives in general and CDSs particularly. Sharia principles that prohibit selling of debt and non-owned assets protect against CDSs respectively. Moreover, the noble objectives of fostering economic development and profit and loss sharing which are imbedded in Islamic finance principles are in utter contradiction to the greediness rooted in conventional finance represented by engaging in speculative transactions for the sole purpose of gaining profits on the expense of other parties. Next table summarizes the comparison between conventional and Islamic transactions in light of 2008 financial crisis.

Conventional	Islamic
Banks/financial institutions engaged in sub-prime lending	Risk–sharing modes are preferred while excessive greed is discouraged.
Rating Agencies gave positive ratings to these securities	Dishonesty is discouraged
Investors/speculators bought securities	Engagement in debt trading is prohibited
Credit Default Swaps (CDS) to hedge/speculate on credit risks	Derivatives are prohibited and speculation is discourage

This pragmatic distinction between conventional and Islamic financial transactions does not mean the financial engineering is fiendish as it is the mechanism that creates and improves derivatives. While innovation and financial engineering can be beneficial, Islamic finance provides viable guidelines for these novelties. In Islamic finance, ethics and morality should never be compromised as the products should serve higher purposes other than merely to contribute to institutions' profitability. Furthermore, Islamic finance promotes transparency, good governance and integrity, a thing that render simple and comprehendible products. Yet, many Islamic financial products today are said to be complicated, a thing that signals worrying tendency to mimic conventional finance.

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