Charles University in Prague

Faculty of Social Sciences
Institute of Economic Studies

MASTER THESIS

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The Regulatory Arbitrage between Basel III and Solvency II: The Role of Alternative Risk Transfers Demonstrated on CDS Spreads - The Case of Italy

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Academic Year: **2013/2014**

Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature, and the thesis has not been used to obtain a different or the same degree.

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Prague, July 15, 2014

Signature

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Abstract

Different capital regulatory requirements in the bank and insurer markets lead to finding and using of new more complex financial tools linked with capital release and subsequent optimization of the investment objectives, but they are also linked with promises and risk transfers that could cause a collapse or a systemic risk of the financial markets, as evidence by the recent financial crisis. The aim of my work is to examine the behavior of credit default swap spreads on the securitization and reinsurance markets, followed by analyzing arbitrage conditions between securitization and reinsurance markets by cointegration analysis. The thesis focuses on Italy because it is one of four main European players in the securitization market and it has highly developed bank and insurer markets. Moreover, it still faces to consequences of the recent financial crisis that is indicator of strong possible bases for above mentioned complex financial instruments. On the dataset of Top 8 Italian banks and insurer companies in the period 2006 – 2012 I showed by cointegration analysis a presence of just one cointegration relationship between securitization and reinsurance market, therefore I rejected possibility of arbitrage between these markets. But on the other hand, they converge to long term equilibrium slowly and uncertain, only 25 % of imbalance is settled during the process, so the field of using complex financial tools for risk transfers remains wide, the threat of future market failures actual further supported by lack of transparency of these flows.

JEL Classification	C23, C29, G19, G21, G22
Keywords	securitization, reinsurance, credit default swap spread, regulatory arbitrage, panel data, cointegration analysis, VECM

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Abstrakt

Odlišné kapitálové regulatorní podmínky na bankovním a pojišťovnickém trhu vedou k hledání a využívání nových finančních nástrojů, se kterými je spojeno uvolnění kapitálu a následná optimalizace investičních cílů, ale také přenos závazků a rizik, která mohou způsobit až kolaps finančního trhu jako celku, jak dokázala nedávná finanční krize. Cílem mé práce je prozkoumat chování credit default swap spreads na trhu sekuritizace a zájistném trhu, následně možnost arbitrážních podmínek mezi těmito trhy. Práce se zaměřuje na Itálii, protože patří mezi čtyři největší evropské hráče na trhu sekuritizace a jeho bankovní i pojišťovnický trh je silně rozvinut, navíc se stále potýká s následky nedávné finanční krize, což je ukazatelem živné půdy pro výše zmíněné komplexní finanční nástroje. Na příkladu Top 8 italských bank a pojišťoven v období 2006 – 2012 jsem kointegrační analýzou ukázala, že mezi trhem sekuritizace a zájistným trhem existuje právě jeden kointegrační vztah, tudíž nemůžeme potvrdit arbitráž mezi těmito trhy, na druhou stranu se své dlouhodobé rovnováze přizpůsobují velice pomalu a nejistě, dochází k vyrovnání pouhých 25 % nerovnováhy, takže pole pro využití složitých finančních nástrojů pro přenos rizik je stále značné, hrozba dalšího selhání trhů aktuální, navíc podpořená netransparentností těchto toků.

Klasifikace	C23, C29, G19, G21, G22
Klíčová slova	sekuritizace, zájistný trh, credit default swap spread, regulatorní arbitráž, panelová data, kointegrační analýza, VECM

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Acronyms

ABCP	Asset – Backed Commercial Paper
ABS	Asset – Backed Securities
ADF	Augmented Dickey - Fuller
AMCR	Absolute Minimum Capital Requirement
ANIA	Association of Insurance Companies
AOF	Ancillary Own Fund
BCBS	Basel Committee on Banking Supervision
BNL	Banca Nazionale del Lavoro
BOS	Basic Own Fund
BSCR	Basic Solvency Capital Ratio
CAT	Catastrophe
CDO	Collateralized Debt Obligation
CDS	Credit Default Swap
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CLO	Collateralized Loan Obligation
DF	Dickey - Fuller
ECB	European Central Bank
EG	Engle - Granger
EU	European Union
GDP	Gross Domestic Product
GLS	Generalized Least Squares
IAIS	International Association of Insurance Supervisors

ILS	Insurance – Linked Securities
IMF	International Monetary Fund
KPSS	Kwiatkowski – Phillips – Schmidt - Shin
LCR	Liquidity Coverage Ratio
LR	Leverage Ratio
MBS	Mortgage Backed Security
MCR	Minimum Capital Requirement
NSFR	Net – Stable Funding Ratio
OLS	Ordinary Least Squares
QIS5	Fifth Quantitative Impact Study
RMBS	Residential Mortgage – Backed Security
ROA	Return on Assets
ROE	Return on Equity
ROTE	Return on Tangible Equity
RWA	Risk Weighted Assets
SCR	Solvency Capital Ratio
SEC	Securities and Exchange Commision
SPV	Special Purpose Vehicle
US	United States
VaR	Value at Risk
VECM	Vector Error Correction Model

Master Thesis Proposal

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Proposed Topic:

The Regulatory Arbitrage Between Basel III and Solvency II: The Role of Alternative Risk Transfers Demonstrated On CDS Spreads – The Case of Italy

Topic Characteristics:

The main aim of my master thesis is to describe clearly new regulatory conditions under Basel III and Solvency II and possible regulatory arbitrage across banking and insurance sectors. A cooperation between bank and insurer sectors leads to an approximation of these two kinds of financial institutions and a loss of their traditional roles. I focus on a role of credit default swaps (CDSs) in the process.

The CDS is a powerful financial instrument for transfer risk, transfer financial promises and reduction of required capital. On the other hand represents a source of systemic risk how full effect at the time of financial crisis.

I analyze CDS behavior due to main macroeconomic characteristics of both sectors, introduction of capital requirements of both sectors, factors connected with possible arbitrage (amount of securitization).

After that I follow by analyzing long-term behavior between our two examined markets – securitization and reinsurance Italian markets. In other words I will focus on presence or absence of cointegration relationship between them.

It is highly current topic and the CDS belongs to powerful economic tools. That is my motivation for my research.

Hypotheses:

My hypotheses are:

I. CDS spreads are negatively correlated with volume of securitization

II. CDS spreads are negatively correlated with volume of reinsurance

III. Regulatory arbitrage between reinsurance and securitization market is not significant

Methodology:

In my research I will focus on Italian banking and insurance market and testing the arbitrage conditions between them. The research will be performed seven year time period, 2006 – 2012, with using dataset

from Top 10 Italian banks and Top 10 Italian insurers.

To estimate two first hypotheses I use panel data analysis, as a dependent variables will be use volume of securitization (reinsurance) collected from Top 10 Italian banks and insurers. The main explanatory variable – CDS spread – will be obtained from Bloomberg dataset.

In the last hypothesis I examine the regulatory arbitrage by using cointegration analysis. Despite a lot of weaknesses we firstly use Engle-Granger method for finding a cointegration, moreover I use also Johansen test and VECM – Vector Error Correction Model.

The most important part is a selection of independent variables and they will be divided to three categories.

The first one will be fundamental bank and insurer specific variables - equity to total asset, net loans to total asset, cost to income, cost to income ratio - which are commonly abbreviated as CAMEL risk factors.

The second one will focus on bank and insurer market and macroeconomic variables – GDP growth, Inflation, Stoxx 600 Bank Index, Stoxx 600 Insurer Index, Central Bank Assets to GDP, Insurance Company Assets to GDP.

Finally, I add variables related to the issue – CDS spreads from Bloomberg database.

I will use dataset from Bloomberg, www.infobila.ania.it and publicly available statistics and annual reports.

Outline:

1. Introduction
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    a. Capital requirements under Basel III and Solvency II
    b. Securitization, Reinsurance and risk transfers
    c. Credit Default Swap
    d. Italian bank and insurer market
    e. Description of the model
3. Empirical analysis
    a. Empirical results
    b. Testing of my hypothesis
4. Conclusion
    a. Final discussion most important parts of the model

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Author **Supervisor**

1 Introduction

The question of regulation of the bank and insurance markets is currently of utmost importance. The requirements conditions are still more stringent, but they are not uniform across different markets, so it results into a cooperation among the markets and into finding new more complex financial instruments which brings the risk transfer. Of course I am not mentioning only risks transfer to a final investor but also the risks threatening entire markets – the systemic risk - which lead to instability of financial system and cause deep recessions, crises or other potential financial catastrophes.

The cooperation between banks and insurers under the new regulatory requirements is becoming stronger and stronger. It leads to a question of a use of securitization and reinsurance and also the general question still spreading all markets of structured finance. CDS is a financial tool, that played a significant role in financial crisis, and it is one of the most developed markets – the CDS market – therefore I decided for CDS as a proxy of risk transfer instrument and I will examine how important and significant factor it is for development of securitization and reinsurance markets. Moreover CDS is a powerful financial instrument for transfer risk, transfer financial promises and reduction of required capital.

The inspiaration to examine new financial tools and their impact on financial stabiblity, moreover the question of regulatory arbitrage or doubtful role of credit rating agencies I found out in the work by M.J. Flannery, J.F. Houston and F. Partnoy (2010), "Credit Default Swap Spreads as Viable Subtitutes for Credit ratings" and in the article by M. Ojo (2011), "Financial Stability, New Nacro Prudential Arrangements and Shadow Banking: Regulatory Arbitrage and Stringent Basel III Regultions".

For my research I chose Italy, because it belongs to four main European players of securitization market and it is a good base for reinsurance market. Moreover I need a country

where also bank and insurance markets are very well developed, for adequate research of their relationship. Italy meets all these requirements.

The thesis is structured as follows: Chapter 2 provides theoretical framework of Basel III and Solvency II, current regulatory conditions, their planned changes, progressive implementation and example of regulatory arbitrage between bank and insurer sectors. Moreover provides description of the mechanism of the securitization and reinsurance. More detail view about Italian bank and insurer market is brought in Chapter 3, including the recent event – unexpected loss of UniCredit. Moreover, in Chapter 3 I focus on description of my dataset, as well as on description of methodology, final models of our three hypotheses and their results. Conclusion is to follow in Chapter 4.

2 Theoretical framework

2.1 Basel III

Basel III - The Third Basel Accord reacts to recent financial crisis and proposes new regulatory requirements or tightens the previously established. This Accord was designed by members of Basel Committee on Banking Supervision (BCBS) in 2010 – 2011 and it should be introduced by degrees in 2013 – 2015, while certain adjustments are to be implemented by March 2015. Basel III still maintains the three-pillar structure and in each of the pillar has set its goals. The theoretical part focuses on goals corresponding to Pillar 1, especially its aims to raise a quality, consistency and transparency of the capital base and reinforce the banks ´ liquidity risk management. The key requirements are following:

- Capital requirements and capital buffers
- Minimum leverage ratio (LR)
- Liquidity requirements – introducing two liquidity ratios
    - Liquidity Coverage Ratio (LCR)
    - Net – Stable Funding Ratio (NSFR)

2.1.1 Capital Requirements and Capital Buffers

The capital structure is primarily case of strengthening of the requirements. Firstly was defined more clearly all three capital Tiers, respectively three-tier structure has been simplified to two Tiers: Tier 1 and Tier 2 and Tier 3 was proposed to abolish.

The Tier 1 capital is going-concern capital. How is mentioned in "Thinking beyond Basel III: Necessary Solutions for Capital and Liquidity" by A. Blundell-Wignall and P. Atkinson (2010): *"Tier 1 capital will consist of going concern capital in the form of common equity (common share plus retained earnings) and some equity like debt instruments which are both subordinated and where dividend payments are discretionary."* And in a working paper: "Possible unintended Consequences of Basel III and Solvency II" by A. Al-Darwish et al. (2011) is Tier 1 defined: *"The qualifying elements within Tier 1 are the common shares, minority interests, and retained earnings, from January 2013, other instruments not meeting criteria for inclusion in common equity will be excluded and will be phased out over a 10-year horizon."*

To be clear, the Tier 1 capital contents:

Tier 1 capital = **permanent shareholders´ equity** (e.g. common stocks/shares) **+**
+ disclosed reserves (e.g. retained interests, share premiums)[1]

The Tier 2 capital is gone-concern capital (capital absorbing losses in liquidation) and is defined:

Tier 2 capital = undisclosed reserves + revaluation reserves + general provisions/loan-loss reserves + hybrid (debt/equity) capital instruments[2]

The Tier 3 capital which primarily utilization was cover the market risk was proposed to abolish. The Tier 3 capital is not eligible under Basel III.

[1] More in detail – Basel III handbook (2012)
[2] More in detail – Basel III handbook (2012)

The most important change is the minimum of common equity which increase to 4.5 %. Furthermore under Basel III is required additional capital of Tier 1 capital (1.5 % of RWA) and Tier 2 capital (2 % of RWA), where RWA is signature for risk-weighted assets.

Secondly, I focus on new a requirement - capital buffers. There are two required ones under Basel III - the Capital Conservation Buffer and the Countercyclical Capital Buffer. The capital buffers should not be understood as the minimum capital requirements. Both of them are established above it and are designed to avoid breaching the minimum capital requirements, particularly in periods of stress. Both of these buffers are built up during periods outside the stress (good economic periods) and could be drawn down in stress periods (bad economic periods). Because of this approach they help to reduce pro-cyclicality.

As was mentioned the Capital Conservation Buffer is established above the minimum capital requirement and the range is 2.5 % of RWA. It will be built up gradually from January, 1 2016 to 2018 and has to be fully effective as of January, 1 2019. It will begin by 0.625 % the first year and each subsequent year increase by 0.625 percentage points till the moment when reach the top – 2.5 %. It will need to be met entirely by common equity (Al – Darwish, 2011).

Final summary:

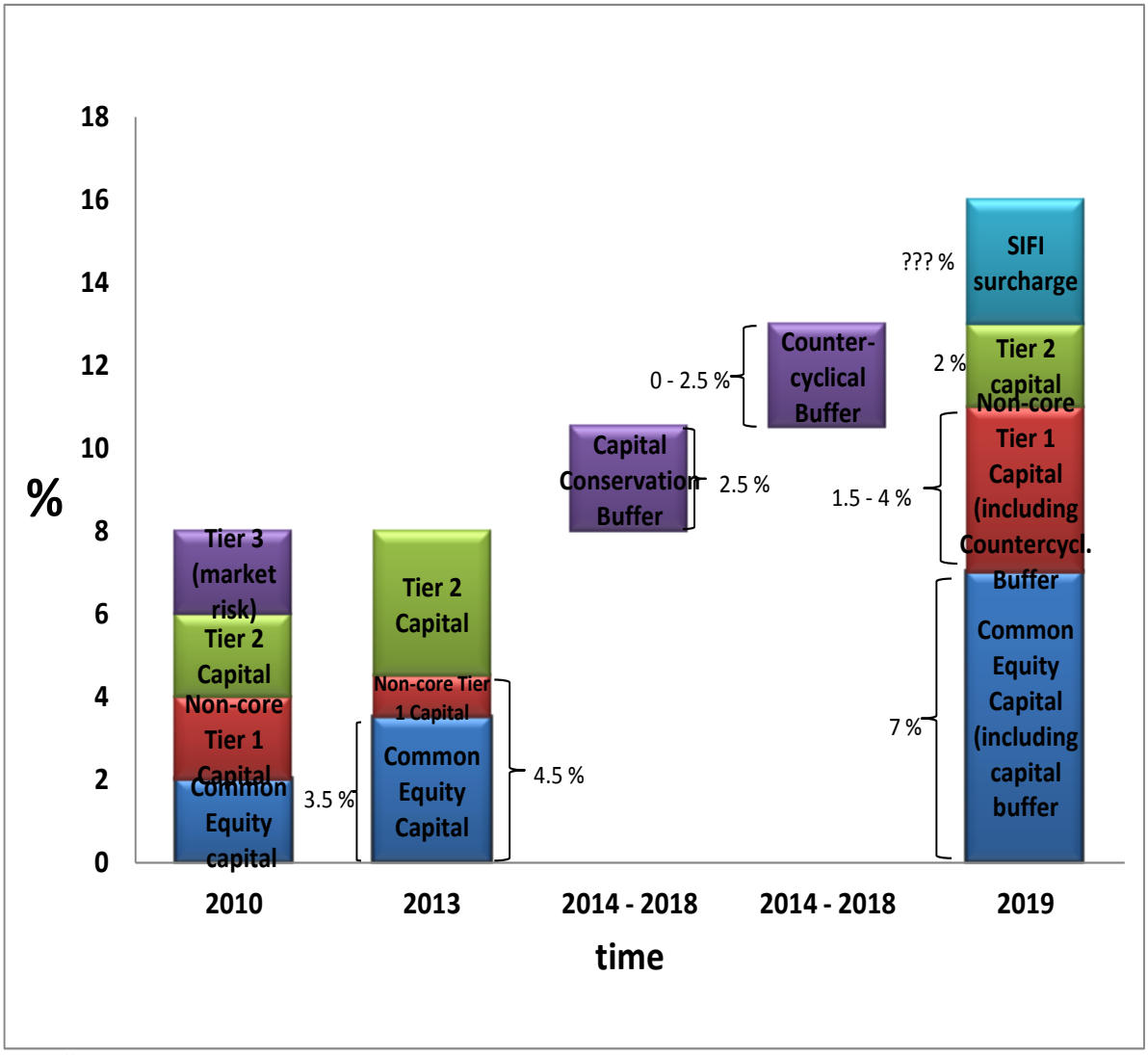
- Necessity of holding common equity increase from 2 % to 4.5 %

$$\text{common equity} \leq 4.5\ \%$$

- Implementation of 2.5 % of the Capital Conservation Buffer
- Implementation of 0 % - 2.5 % of the Countercyclical Capital Buffer
- Additional Tier 1 capital of 1.5 % of RWA is required under Basel III
- Additional Tier 2 capital of 2 % of RWA is required under Basel III

An overview at the Figure 1 to whole process in changes of capital requirements in period 2010 – 2019:

Figure 1: Capital Requirements and Their Changes in Years 2010 - 2019



Source: Česká spořitelna, (2010)

How can I discern in the Figure 1 the total capital requirement (Tier 1 capital + Tier 2 capital) increase to 10.5 % by 2019. In Basel II 8 % it was required and as mentioned above – Tier 3 was included. The 10.5 % level is consists of 7 % (common equity capital + capital buffer), 1.5 % of additional capital of Tier 1 (non-core capital) and 2 % of Tier 2. A variable

part is represented by Countercyclical Buffer (0 – 2.5 %). Generally it means 10.5 % + (0 – 2.5 %) = 10.5 % - 13 %.

2.1.2 Minimum Leverage Ratio (LR)

The minimum leverage ratio was introduced by Basel III. The main aim of this ratio is to set certain capital adequacy and to set the framework to which level a bank could leverage its capital base preventing the high increase of balance sheet and off-balance sheet. It is a relationship between core capital and total assets. It is computed as ratio of Tier 1 capital to the total unweighted assets, including some off-balance sheet assets. The unweighted assets include provisions and loans, off-balance sheet items fully conversion and all derivatives (Al – Darwish, 2011).

$$\text{Tier 1 Leverage Ratio} = \frac{\text{Tier 1 Capital}}{\text{Total Exposure}} \geq 3\%$$

The required minimum leverage ratio is 3 %.[3] The test about 3 % level of leverage ratio and its component started in 2013 by supervisors, but the disclosure will be from 2015 mandatory, as an official introduction to Pillar 1, in 2018.

[3] "*The US is moving in the direction of considering an even higher leverage ratio requirement than Basel 3% standard. US regulators have proposed a concsolidate bank holding company leverage ration requirements 5% for BHCs with nore than $700 billion in assets or $10 trillion in assets under custody. Bank subsidiaries of such BHCs would face a well-capitalized leverage ratio threshold of 6%.*" by E&Y publication, July 2013, „Global Regulatory Network Executive Briefing"

2.1.3. Liquidity Requirements

The BCBS proposed two new liquidity ratios, where both of them aim to reduce a liquidity risk. The Liquidity Coverage Ratio (LCR) has to ensure sufficient amount of high-quality liquid assets to the banks to cover their 30 days Net Cash Outflow which corresponds how its definition.

$$LCR = \frac{\text{High Quality Liquidity Assets}}{\text{30 Day Net Cash Outflows}}$$

where High Quality Liquidity Assets are assets which are easily convertible into cash with small or no changes in value. There could be included assets with these fundamental characteristics: **low risk** (high credit standing and low level of subordination means higher liquidity), **ease and certainty of valuation** (standardized, homogenous and simple structure of assets tends to their higher liquidity), **low correlation to risky assets**, **listed on a developed and recognized stock** (BCBS, 2013). 30 Day Net Cash Outflows are based on the modeling of funding run-offs: stable and less stable deposits, unsecured wholesale funding and secured (collateralized) funding run-off (Blundell – Wignall, 2010).

The implementation of the LCR will start on January, 1 2015 at minimum level 60 %. Each following year will increase by 10 percentage points and reach the top 100 % on January, 1 2019, when it becomes fully efficient.

The Net Stable Funding Ratio (NSFR) was proposed to ensure stable funding over a 1 – year horizon. The ratio defined like ratio of Available Stable Funding to Required Stable Funding has to be higher than 100 %.

$$\text{NSFR} = \frac{\text{Available Stable Funding}}{\text{Required stable Funding}} \geq 100\ \%$$

Due to the fact, that this ratio depends on ability of firms and supervisors correctly determine investors´ behavior, i.e. determine what is "stable" and "unstable", it is quite poor measure. It will be implemented on January, 1 2019.

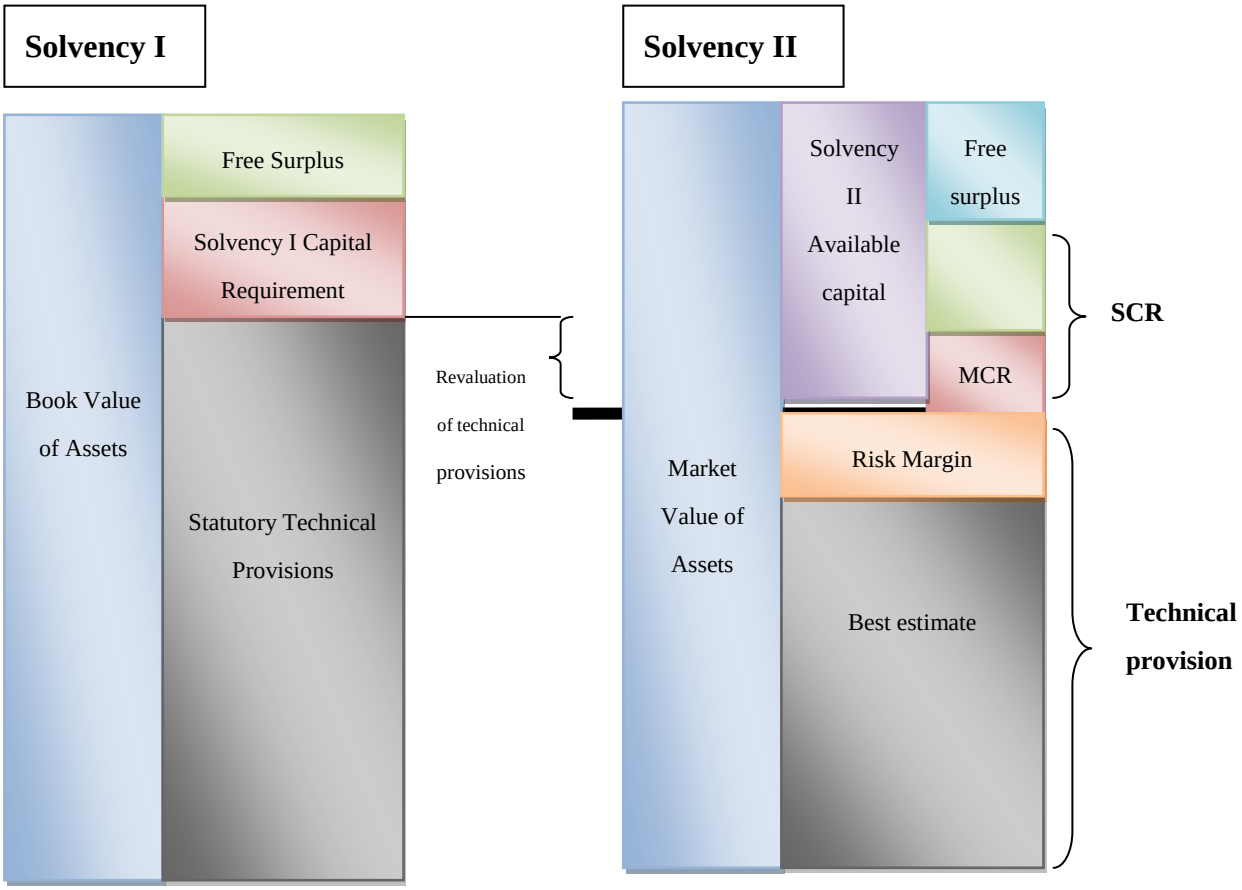
2.2. Solvency II

The Solvency II was originated from European Commission[4] and was established to harmonize insurance solvency regulation and capital standards. As a result, it will establish the unified insurance market and protection of consumers. It reacts to the fact, that by this time EU jurisdictions and reforms were not sufficient: therefore, so many member states introduced their own reforms and thus the whole European market was not in harmony.

As well as the Basel III the Solvency II has also three-pillar structure. Pillar 1 comprises qualitative and quantitative capital requirements. Along technical provisions there are determined two main ratios: Solvency Capital Requirements (SCR), which represents a level of capital which should cover the risk of the current business as well as the new expected business which is to be coming up in following 12 months, and Minimum Capital Requirements (MCR) which represents a threshold below which an insurer would be considered a gone-concern so the intervention of supervisory cannot be avoided and would be immediate. The graphical representation is shown in the Figure 2.

[4] Solvency II is originated by European Commission, not by International Association of Insurance Supervisors (IAIS). This fact could be surprising because IAIS is insurance equivalent to Basel Committee on Banking Supervision (BCBS) – originator of Basel III

Figure 2: From Solvency I to Solvency II



Source: Deloitte[5], (2010)

Pillar 2 is responsible for control of internal risk and risk management and it defines processes and supervisory interventions in case of their breaches. Pillar 3 focuses on disclosure information (requirements) and their intelligibility. Implementation of the Solvency II was postponed several times. Actually, the most probable term is 2015 with reaching full effect in 2016.

[5] The valuation of assets and liabilities should be followed Solvency II valuation rules: Both assets and liabilities are to be fair-valued and the risk margin should be calculated using the Cost of Capital method

As mentioned above Pillar 1 comprises qualitative and quantitative capital requirements. For their calculation is using a total balance sheet approach which means that *determination of insurer´s ability to cover its obligations with the required level certainty should be based upon its total financial position* (Deloitte, 2010) - taking into account actual risk in balance sheet and any offsetting effects (Al – Darwish, 2011).

The Solvency II uses both absolute and risk-based minimum capital requirements (SRC, MRC). The minimum absolute level of capital requirements differs on the basis of an insurer´ business. For detail see the Table 1:

Table 1: Minimum Absolute Level of Capital Requirement

Insurer´ Business	Minimum Absolute Capital Requirement
Captive Insurer	EUR 1 million
Non-life Insurer	EUR 2.2 million – EUR 3.2 million[6]
Life Insurer and Reinsurer	EUR 3.2 million

Source: Author based on Al-Darwish, (2011)

The risk-based level of capital requirements are represented by two ratios, MCR and SCR, which are closely related.

2.2.1. Minimum Capital Requirements (MCR)

The MCR is measured by Value at Risk (VaR) and corresponds to a confidence level of 85 % over 1 year. The MCR should always be lower than SCR, but their calculations are not on the

[6] Depends on the classes of business written

same basis therefore their relationship has to be specified in percentage. The Solvency II establishes a floor of the MCR as well as a cap. The floor is determined to 25 % of SCR and the cap 45 % of SCR. For smaller insurers the cap could be determined higher. Although the MRC aims to cover a risk, its calculation is not risk base but linear base. For risk factors are used selected components from insurers´ liabilities or premiums, and has to be recalculated quarterly. Finally, it must be fulfilled by the eligible Basic Own Fund (BOF).

2.2.2. Solvency Capital Requirement (SCR)

The SCR is also measured by VaR but corresponds to a confidence level of 99.5 % over 1 year. In contrast to the MCR it is calculated on a risk-base using a standard formula or internal model and has to be recalculated yearly or when an insurer´s risk profile changes significantly. The SCR can be fulfilled by all eligible capital including Ancillary Own Fund (AOF).

2.2.3. Calculation of Capital Requirements

The MCR ratio is calculated as follows:

$$MCR = Max \{MCR_{combined}; AMCR\}$$

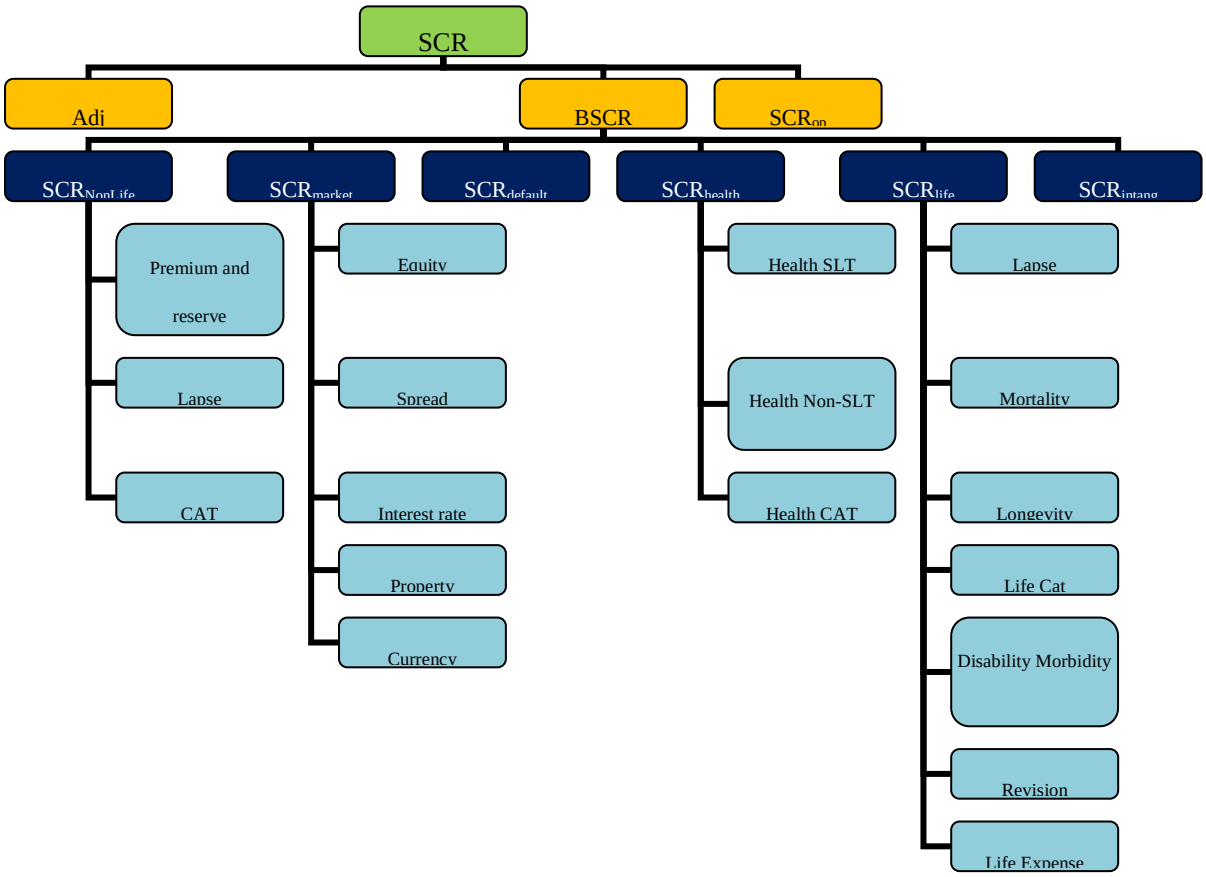
where AMCR is the absolute floor of MCR, $MCR_{combined}$ is estimated as Min [Max (MCR_{linear}; 0.25xSCR); 0.45xSCR], where MCR_{linear} is the sum of a linear formula components of life and non-life insurance or reinsurance obligations.

For calculation of the SCR ratio there is a lot of modifications and methods which allow undertakings to choose the best one that corresponds to a nature, scale and complexity of the risk. I use the general formula from "QIS5 Technical Specifications" issued by European Commission (2010).

$$SCR = BSCR + SCR_{op} + Adj$$

where BSCR is the Basic SCR, SCR_{op} is the capital requirement for operational risk and Adj is the adjustment for the risk absorbing effect of technical provisions and deferred taxes – potential cover of unexpected losses from decreasing of technical provisions and deferred taxes. The Adj component should not be positive.

Figure 3: Solvency Capital Requirements



Source: Author based on Deloitte, (2010)7

The key part of the standard formula is BSCR which is calculated before any adjustment and which combines the capital requirements of all individual risks: market risk, counterparty risk, life and non-life underwriting risk and health underwriting risk. To final formula is also included intangible assets risk.

$$\text{BSCR} = \sqrt{\sum_{ij} Corr_{ij} \times SCR_i \times SCR_j} + SCR_{\text{intangible}}$$

[7] More in detail – Deloitte, (2010)

where SCR_i and SCR_j are SCR values of the individual risk and $Corr_{ij}$ is a given value of the appropriate correlation matrix.[8] The correlation matrix is a fundamental part of the formula. A diversification effect and risk independencies are reflected in SCR formula by correlation matrices and the correlation decreases the requirements significantly in comparison with linear approach (used in the MCR ratio).

2.3. Regulatory Arbitrage

In this part I introduce basic characteristics of the regulatory arbitrage and I demonstrate it on a selected example where will be shown more closely the cooperation between banks and insurers as well as advantages and disadvantages of the whole process. Regulatory arbitrage is used by a financial institution because it is a good tool to release a capital for another investment, to decrease a cost of capital or to shift risks to another financial institution still respecting the capital requirements. Moreover for supervisors it is hard to observe this cooperation which is in nowadays becoming stronger and stronger.

Unfortunately, both accords Basel III and Solvency II (also the previous ones) have the potential unintended consequence in the form of cost of capital, funding patterns, shifting and migration risk across or away from the sectors. Differences in a tax and capital treatments of some specific products[9] lead to tax arbitrage and capital arbitrage. To a small extent, there may occur also a supervisory arbitrage (different supervisory jurisdictions under Basel III and Solvency II) or an accounting arbitrage (Al-Darwish, 2011)

[8] The value of the correlation matrices (across business lines, across risk classes, between risk classes, business lines etc.) could be founded at www.eiopa.europa.eu.

[9] 1) investment products e.g. investment bonds offered by banks, term – certain annuities offered by insurers, 2) protection products e.g. CDSs issued by both banks and insurers, trade finance issued by banks, surely bonds issued by non-life insurers

In the time when strict capital requirements related to the bank sector and Solvency II has not the same aims as Basel III, the costs of capital raised asymmetrically: therefore a field of arbitrage opportunities was much more widespread, thus we witnessed larger risk migration between bank and insurer sectors. Currently the aims are in a process of settlement which lead to minimization of arbitrage opportunities or it could lead to its elimination. On the other hand there are still "moving areas" which are not finalized yet, so nowadays I could speak only about level of exist arbitrage.

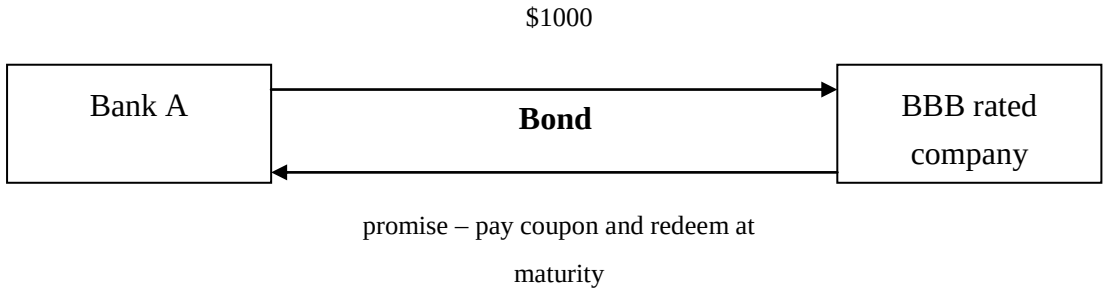
The next and very serious problem is a risk transfer across sectors caused by different risk facing for banks and insurers under the same product. For example, equity investment face stricter capital requirement in bank sector than a non-life insurance sector. Because of this reason the banks have a huge initiative to transfer a related risk (market risk) to non-life insurers. These mechanism leads to widespread using of credit default protection instruments such as CDSs, which could be issued by both – banks and insurers.

For the reasons described above and thanks to the great effort of relatively consistent implementation of regulatory framework strong cooperation of banks´ and insurers´ regulators is formed, resulting into a decrease of the level of arbitrage across sectors, while the effort of both sectors of risk migration away from sectors to the third part is increasing. Among tools used for the risk migration outside the sectors belong risk-sharing products which pass away the risk onto customer (not socially suitable possibility) or other tools especially a securitization or reinsurance.

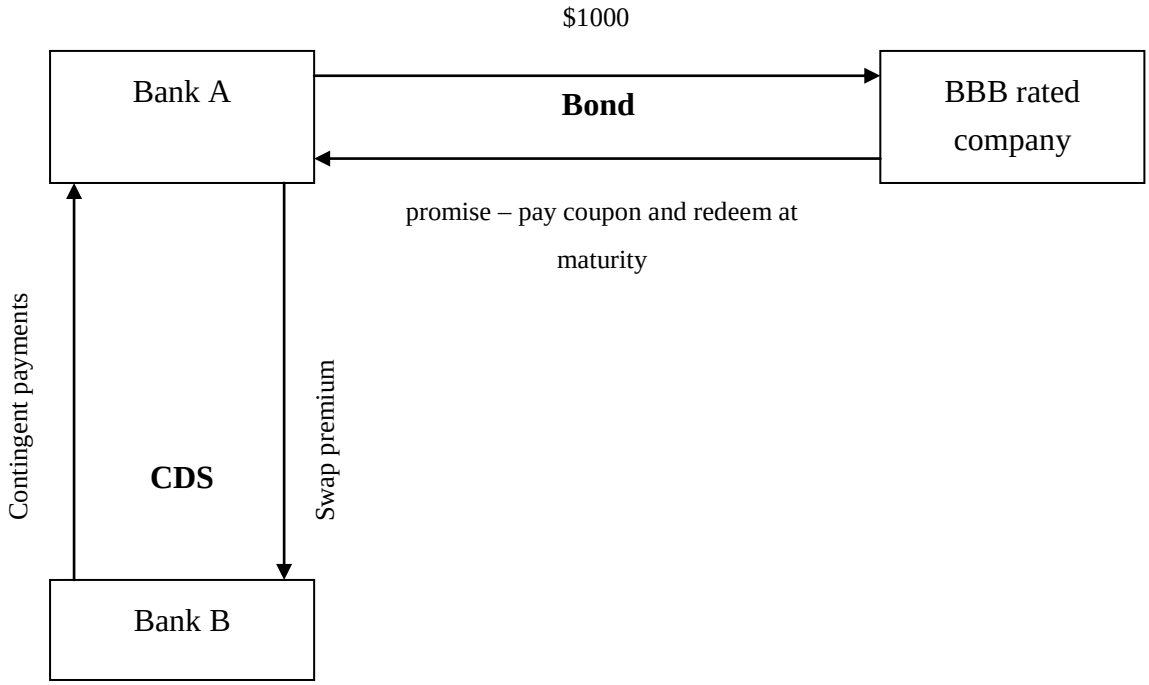
Very high benefit of these tools is an option to remove selected assets from balance sheet and avoid new requirements implemented by Basel III. As mentioned in working paper "Possible Unintended Consequences of Basel III and Solvency II" by A. Al-Darwish et al. (2011): *" When the NSFR requirements become binding, securitization has the benefit of removing long-term assets (like mortgages) from bank´s balance sheet and thus relieving banks from any related Basel III requirements. For insurers, an option for offsetting, the cost of capital under Solvency II, is to use reinsurance and ILS."*

The second example shows us a significant way of shifting financial promises and moving the risk outside the bank sector that means avoiding observance the Basel III capital requirements. The example is set in "Thinking beyond Basel III: Necessary Solutions for Capital and Liquidity" by A. Blundell-Wignall and P. Atkinson (2010) with small modifications by author.

Bank A lends **$1000** to a BBB rated company, **100 % risk-weighted**, by buying a bond and would **have to hold $80 capital**. Bank A holds promise by the company to pay a coupon and redeem at maturity.



Bank A buys a CDS from bank B on the bond, **shorting the bond**, thereby passing promise to redeem from the company to Bank B.



Because bank B is a bank, which carries a 20 % capital weight, Bank A reduces its required capital to 20 % of $80 (**$16**). It is possible to think that Bank B would have to carry the promise 100 % weight of exposure – but **instead it underwrites the risk with a reinsurance company outside of the banking system** – the promise to redeem is now **outside the banks** and the BIS capital rules don´t follow it there. **Bank B´s capital required for counterparty risk is only 8 %** of an amount determined as follows:

- the CDS price of say $50
- regulatory surcharge coefficient of 1.5 % of the face value of the bond ($15)
- 50 % weighting for off-balance sheet commitments

It means that bank B´s capital required for counterparty risk is **$2.6**

$$0.5 \times 0.08 \times (\$50 + \$15) = \$2.6$$

So jointly the banks have managed to reduce their capital required from $80 to $18.6 ($16 + $2.6) or in percent it is **70.6 % fall**.

Table 2: The Final Result

State/capital required	Bank A	Bank B	Total
Initial state	$80	$0	$80
Final state	$16	$2.6	$18.6

Source: Author based on Blundell-Wignall, (2010)

As is evident, there is a small area to determine a risk in the beginning of the whole process based on company bond as 100 % risk weighted in the first step.

2.4. Securitization

As mentioned above the securitization is very powerful financial tool used for risk migration outside the bank sector. The aim of this section is to describe clearly securitization process and players of the process, an importance of the role of securitization markets in financial stability demonstrated on its position during global financial crisis.

2.4.1. Advantages and Disadvantages of Securitization

As well as any financial tool also the securitization could be supportive for efficiency of the market. It helps to release a capital which means more opportunities for new loans and credit places, in case that the originator is a bank. "*Benefits obtained by lower funding costs could*

optimize and economize capital utilization of financial institutions in behalf of another business and consumers." (IMF, 2013)

From the immediately investment point of view is very useful the ability to transform illiquid assets to tradable liquid securities that means support a liquidity of the final market that could create a reinvestment book. Also the securitization represents a valuable tool for assisting with the resumption of credit flow of worthy borrowers (IMF, 2013).

Finally I mention here the risk diversification and transfer across different asset classes, industries, instruments, markets which I demonstrate on catastrophe bonds (CAT bonds) which arose by need insurance companies risk mitigation in case of occurrence huge catastrophe and incurred damages are not able to cover by the premiums or return from investment (IMF, 2013).

On the other hand with the securitization process are linked various disadvantages and costs. The most dangerous problem I find in non-transparency of the whole process and hence causes possible inability to determine correct risk faced of potential investors and strong information asymmetry. It leads to strong dependency of investors and whole industries on external rating agencies. It destroys any initiative and ability to formulate own ratings and models for investment decision. Such nonstandard behavior could widen through all market or industry and lead to systemic risk.

Finally, I could say that it is impossible inherently say if the securitization is totally positive or negative process for the financial markets. The same result is reached in the subchapter 2.4.3. Securitization and its Role in the Global Financial Crisis.

2.4.2. Development of Securitization

The securitization industry appeared in United States in 1970 when Government National Mortgage Association ("Ginnie Mae") became the first organization to guarantee mortgage-backed products to eligible families. After a year started its securitization business in residential home mortgages Federal Home Loan Mortgage Corporation ("Freddie Mac"), followed by Federal National Mortgage Association ("Fannie Mae") in 1981. Both of them Freddie Mac and Fannie Mae fulfill its task to enhance the flow of credit to residential real estate market (IMF, 2013).

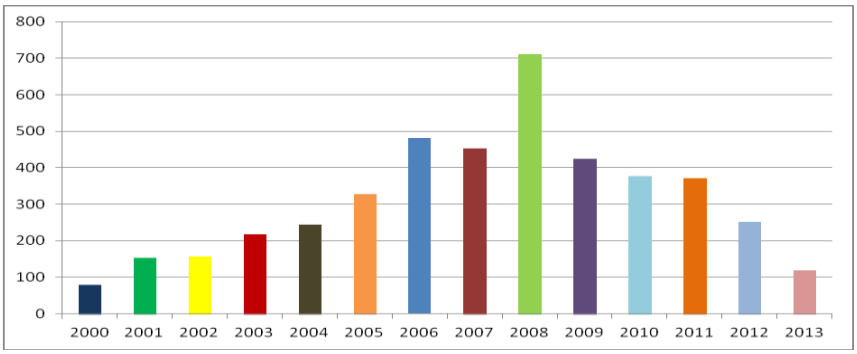
For fifteen years securitization industry had developed on the American continent, after that it widened to Europe - as a first to United Kingdom,[10] to continental Europe a further five years later. Despite the fact that in the United Kingdom, there is no legal framework and its securitization market is relatively small in relation to the global industry, it is a European leader followed by all other continental countries. The first mortgage securitization in Europe is dated there in 1985, followed by France three years later.[11]

While other securitization markets expanded and peaceful developed, subprime securitization has become fixed part of ABS US market, moreover collateralized debt obligations (CDO) and credit default swaps (CDS) were developed and also adopted to ABS (late 1990s) and no market collapse or hesitation did not appear, the years before the crisis were filled with huge boom of structured products issuance, low – quality and high complex products issuance and uncontrolled expansion of securitization markets. Increasing amount of annual securitization issuance is shown in the Figure 4.

[10] Until nowadays the United Kingdom belongs to 4 main European securitization market players. The others are The Netherlands, Spain and Italy.

[11] In detail: The legal framework in France was established in 1988 with consumer loan ABS issued subsequently (IMF, 2013), followed by first RMBS transaction in 1991.

Figure 4: Annual Securitization Issuance in Europe (EUR billion)



Source: Author based on European Securitization Forum

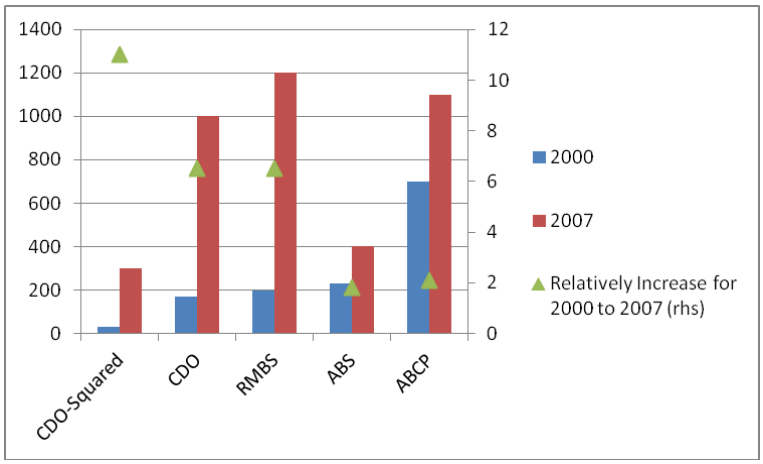
Note: Figure for 2013 are based on data Q3, 2013

The change in the issuance policy, when issuance process transfer to private sector linked with dramatically worse lending standards[12] fully manifested and formed picture of next years. During this period of time was recorded a high and significant expansion of securitization, a share of private issuance increased more than three times[13]. Sharp increasing was noticed also in the collateralized debt obligation (CDO) and CDO-squared products where the issuance increased six times, respectively eleven times. For more details, see the Figure 5.

[12] In 2000, in the U.S private market was issued US$1 trillion, five times more than in Europe. (IMF, 2009)

[13] Private-label residential MBS issuance in the United States increased from US$148 billion in 1999 to US$1.2 trillion by 2006 (Figure 5), increasing its share of total issuance from 18 percent to 56 percent. (IMF, 2013)

Figure 5: Global Private – Label Securitization Issuance by Type (US$ Billion)



Source: Author based on (IMF, 2013)

It was the period of time when banks asked more for market-based funding instead of deposit-based funding and these changes had to be necessarily accompanied by imbalances and uneconomic behavior of market participants like overdependence on rating agencies, lack of transparency linked with no economic motivation for originators and creation of self-destructive spiral how is described more in the follow subchapter. Unfortunately, despite the crisis, many European Central Bank (ECB) documents prove continuation in issuing in structured products and securitization.

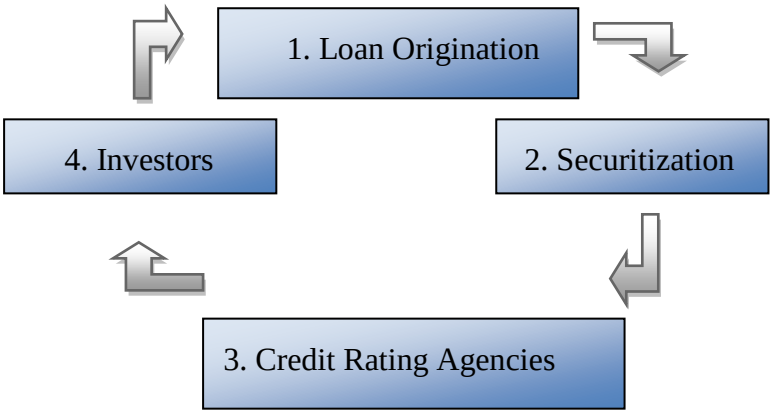
2.4.3. Securitization and its Role in the Global Financial Crisis

The securitization is very closely associated with the global financial and perhaps because of a strength and non-transparency of the whole process it is very often considered as the only or the main cause of the crisis. But I would like to point out the fact, that the securitization is very important and strong channel for spreading the crisis, but by far not the only article of the whole system which caused the crisis.

The system (see the Figure 6) is composed by four elements – loan originators, securitization intermediaries, credit rating agencies and investors. All of these factors play a

significant role in the financial market during the crisis but individually did not mean threat of systemic risk until they started to reinforce themselves. The securitization is the channel that increases a leverage effect and a risk concentration across the financial sector (IMF, 2013) thus strengthening the systemic risk.

Figure 6: The Role of Securitization in Four Elements System



- ***Loan Origination***

  The most important role of this factor is observable when loan origination (specifically mortgage in the beginning) began to migrate outside from regulated banking sector. Very quickly high volume[14] of mortgages was originated by independent mortgage companies in non regulated market which results poor underlying origination practices. High demand for structure credit assets increases a loan origination and subsequently deterioration of lending standards and increasing of asset prices.

- ***Securitization***

  Brokers and dealers on the demand side are "lovers" of new trends so boom of securitization in period of time 2000 – 2007 was extremely welcomed by them. The

[14] In 2006 on US mortgage market was originated 45 % mortgages outside non regulated banking sector.

problem is that brokers and dealers´ business goal is a volume of written loans and they have no economic motivation for the business and the question about repayment ability of borrowers does not appear. And as mentioned above the securitization increases a leverage effect and a risk concentration across the financial sector (IMF, 2013) thus strengthening the systemic risk.

- ***Credit Rating Agencies***

  In the beginning the credit rating agencies should have played a role of external independent rating institution with aim to provide clear and unbiased ratings of underlying assets. But because of the crisis development three main actors of rating market – Standard & Poor´s, Moody´s and Fitch – were subjected to detailed analysis by policymakers, analytics and investors which rebutted the presumption of impartiality.

  Moreover, credit rating agencies are mostly paid by issuers – not by buyer – which represents motivation for agencies to overestimate their ratings because of next business. How is shown in recent study 99 % of outstanding credit ratings is exactly "issue-pay model" and 97 % of outstanding credit ratings are rated by main three market actors (SEC – Annual Report, 2012).

- ***Investors***

  Firstly, investors fully believe to complex methodological calculations[15] of credit rating agencies for determining structured and highly complex products rating. "*Secondly, in the context of highly accommodative monetary policy and abundant*

[15] The complexity of these calculations causes high sensitivity for complex products parameters, so a little change in parameter means high model error. (IMF, 2013)

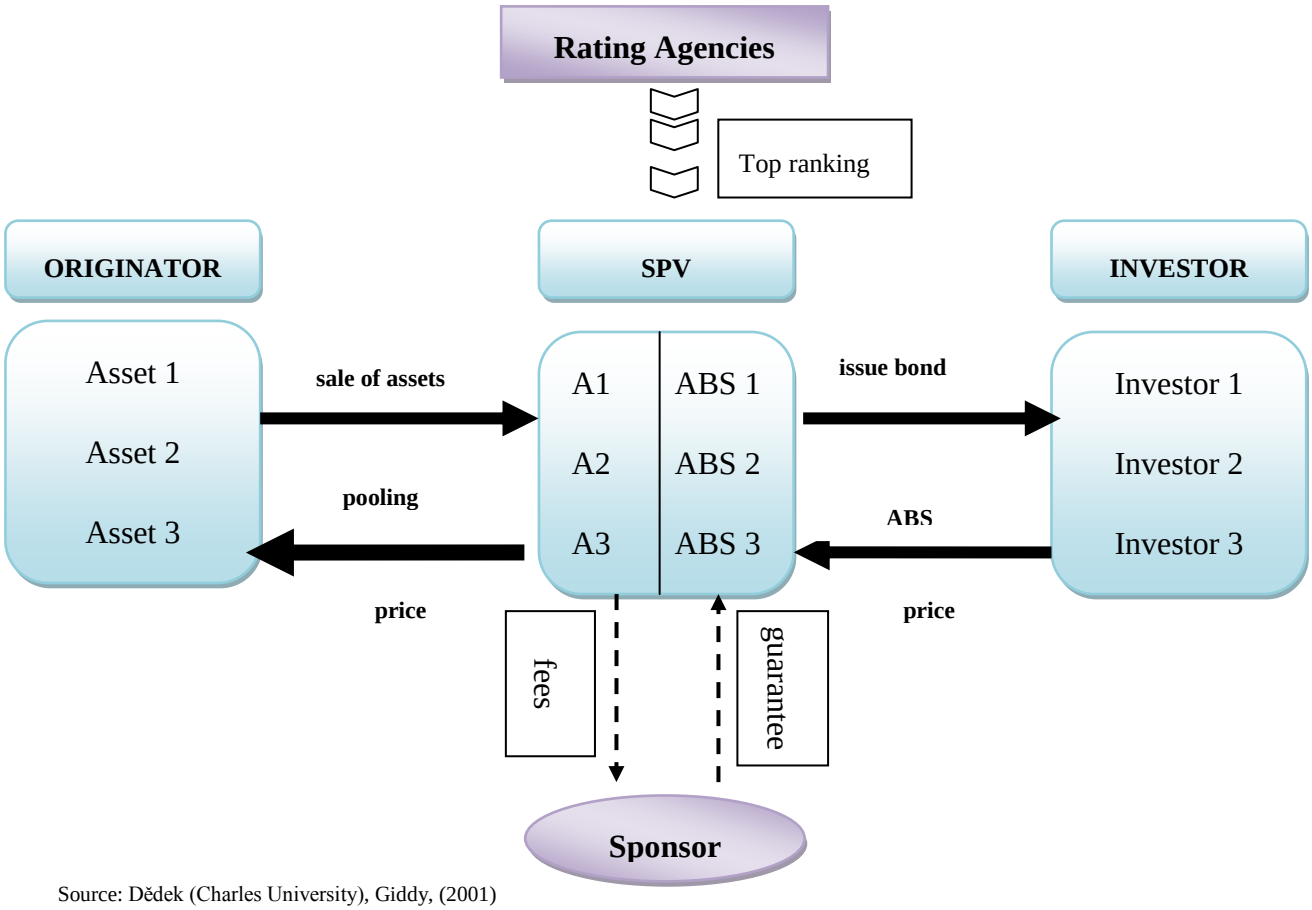
global liquidity, investors "search for yield" they have no reason change their behavior and it was a key contributor to the sharp increase in activity in complex structured credit markets." (IMF, 2013)

2.4.4. Mechanism of Securitization

Securitization is a process which uses various techniques of financial engineering through which an issuer creates a new financial instrument generally called asset-backed security (ABS) by pooling other financial assets. Subsequently ABSs are offered to investors by different market tiers. The mechanism could be described from two views. I called them *macroeconomic view* and *accountant view*. I describe here both of them.

2.4.4.1. The Macroeconomic View

Figure 7: The Mechanism of Securitization with Sponsors



Source: Dědek (Charles University), Giddy, (2001)

The securitization process starts by ***originators*** which are financial institutions (very often banks) that provide loans and sell them to Special Purpose Vehicles (SPV).

Special Purpose Vehicle (SPV) is a financial institution established for the sole goal – to issue a debt - and whose operations are limited to the acquisition and funding specific assets. SPV is a buyer of loan pools that are used as collateral for the security issuance. Cash flows of the securities are derived from the cash flow original loans – this fact also implies that SPV are responsible for dividing benefits and risks. Due to operations, for which are

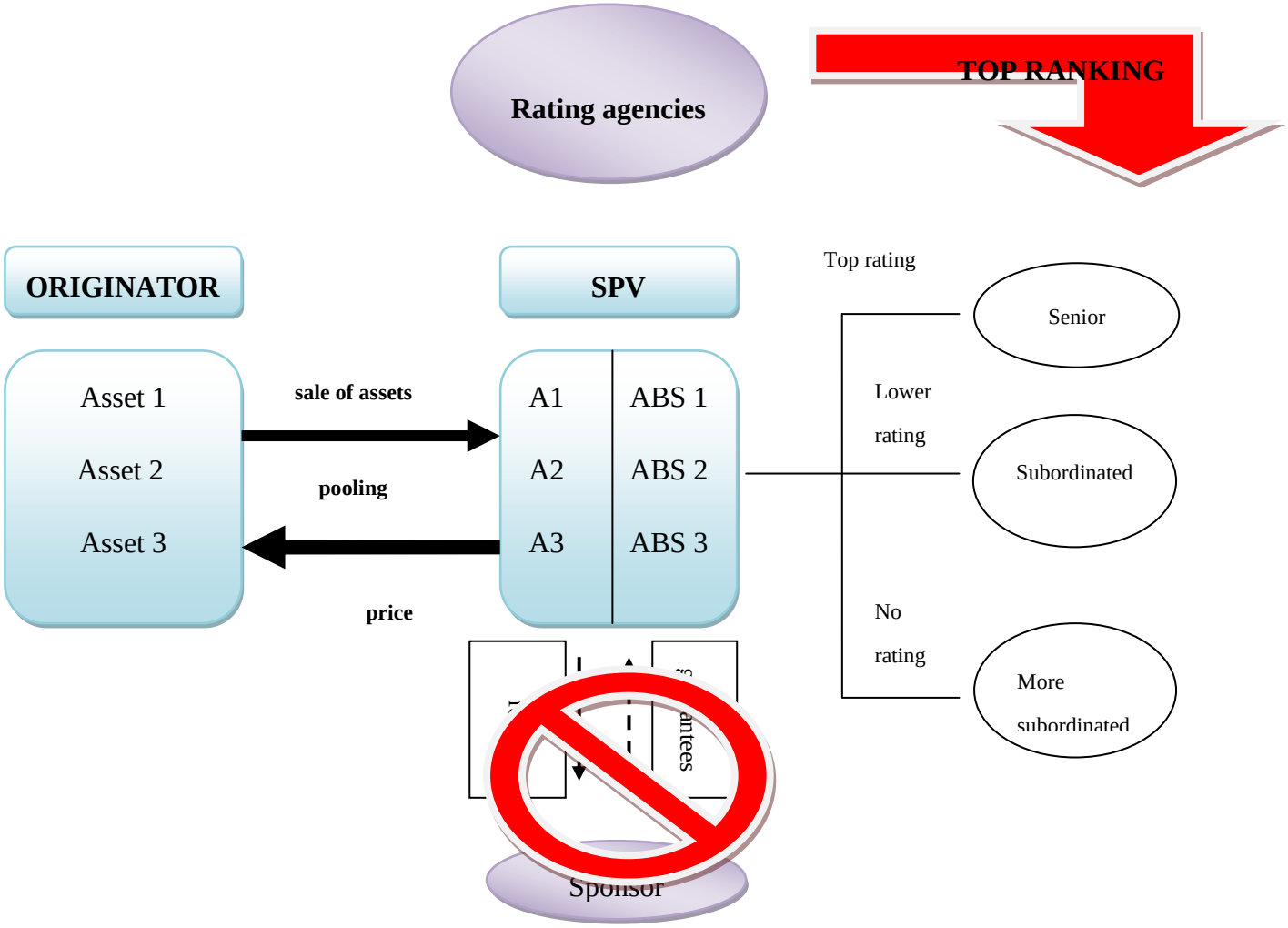
assets used, their cash flows should be easy to model with kind of reliability as loans, credit card receivables (IMF, 2013).

Investors on the base of their risk appetite choose securities to which they will be invest. Important role play here ratings of securities. As is possible to see in the Figure 7, rating agencies have a position "in the middle" of the mechanism and make a pressure to SPV.

Sponsor is a provider of insurance or other form of guaranteeing of cash flows from ABS. Goal of sponsors is decline or limited the credit risk linked with ABS which is transferred to investors. Sponsors are very often government-owned or government-sponsored entities. Private institution guarantee providers (no government support) are called credit enhancements. (Dědek, Charles University)

Presence of sponsors is not necessary, the alternative approach is demonstrated below in the Figure 8.

Figure 8: The Mechanism of Securitization without Sponsors



Source: Author based on Dědek (Charles University), Giddy, (2001)

Let note the differences between these two approaches. Rating agencies does not push to SPV, with that disappear the role of sponsors, but the rating agencies "move" their power directly to the rating issued securities therefore asset-backed securities are issued by *tranches*.

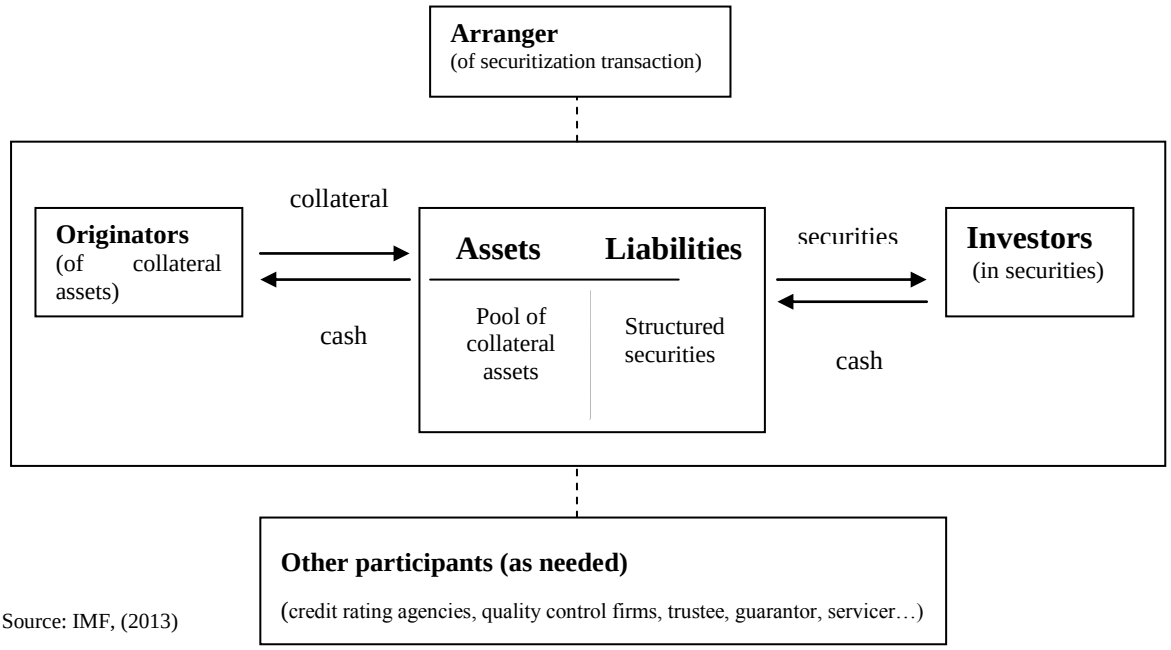
Each tranches are defined by its *attachment point* and *detachment point*. The attachment point is the highest percentage of defaults where the tranche is not still hit. The detachment point is the lowest point where the whole tranche is hit. For example for a (5-12) % tranche is the attachment point 5 % and 12 % is the detachment point. So the lower-rated

tranches are hit as the first and provide protection for higher-rated tranches. The highest tranches are called *senior tranches* and are regarded as the least risky, the lowest tranches are called *junior tranches* and between them are *mezzanine tranches* (Dědek, Charles University). Finally investors decide due to their risk profile to which one they will invest.

2.4.4.2. The Accountant View

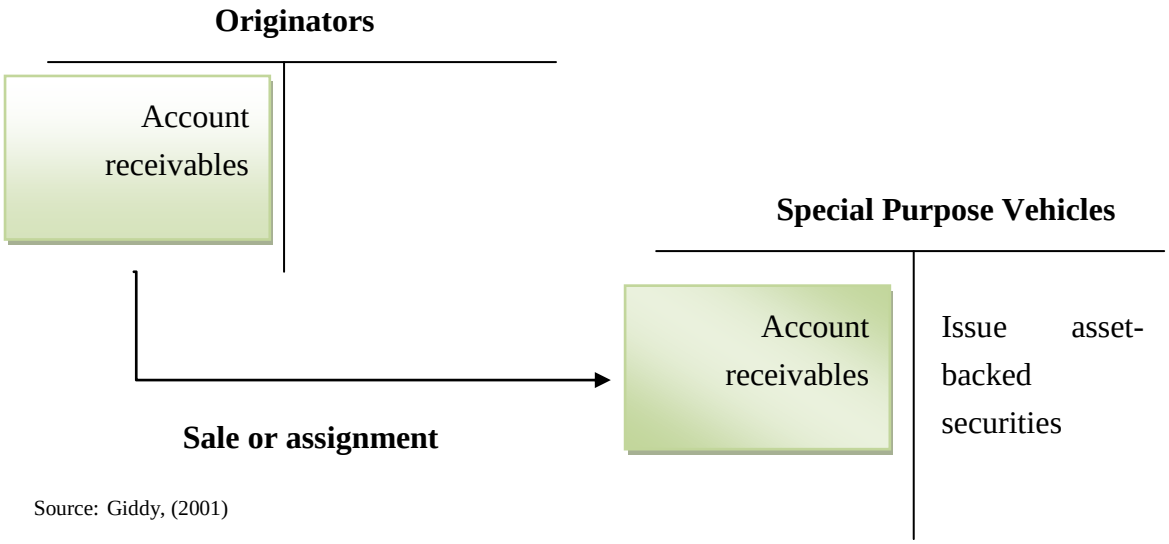
As mentioned above the securitization process started by originator´s sale or loan assignment to Special Purpose Vehicles. That means transfer assets from originator´s balance sheet to some legally separated balance sheet (in our case SPV´s balance sheet) where the pool of collateral assets are covered by structured products – structured securities. The Figure 9 and the Figure 10 illustrate the basic mechanism "accountant" mechanism. The asset transferred to legally separated balance sheet allows the capital and the balance sheet relief used for issuing new loan and investment.

Figure 9: The Basic Mechanism of Securitization



Source: IMF, (2013)

Figure 10: The Accountant View of the Mechanism of Securitization



Source: Giddy, (2001)

The pool of asset in a securitized structure tenders a possibility for asset management. For example securitizations of credit card receivables have a given period in which the receivables are used to purchase new receivables. Other structures as CDOs and CLO have appointed special asset managers for active trading with given part of the pool of underlying assets (IMF, 2013).

2.5. Reinsurance

As well as for the securitization, also for reinsurance I will show *macroeconomic view* including its basics and *accountant view*, where I explain and describe changes which occur when the reinsurance is introduced to insurer´s balance sheet.

2.5.1. The Macroeconomic View

Reinsurance is a process where insurance company, also called „ceding company“ or „cedant“, purchases an insurance from one or more other insurances companies – called

reinsurers. The reinsurance is a traditional way for risk transfer, risk diversification and risk management.

Insurerance companies are final institution in the insurance process so they are burdened by huge volume of risk, in that point of view they become *risk warehouse* or *risk absorber*. That is the reason why they are looking for other institutions that could absorb larger so that means to reduce the amount of necessary capital for coverage. The cedants pay to reinsurer regular contingent payments in exchange for transfer some part of risk of losses (Cummins, 2009).

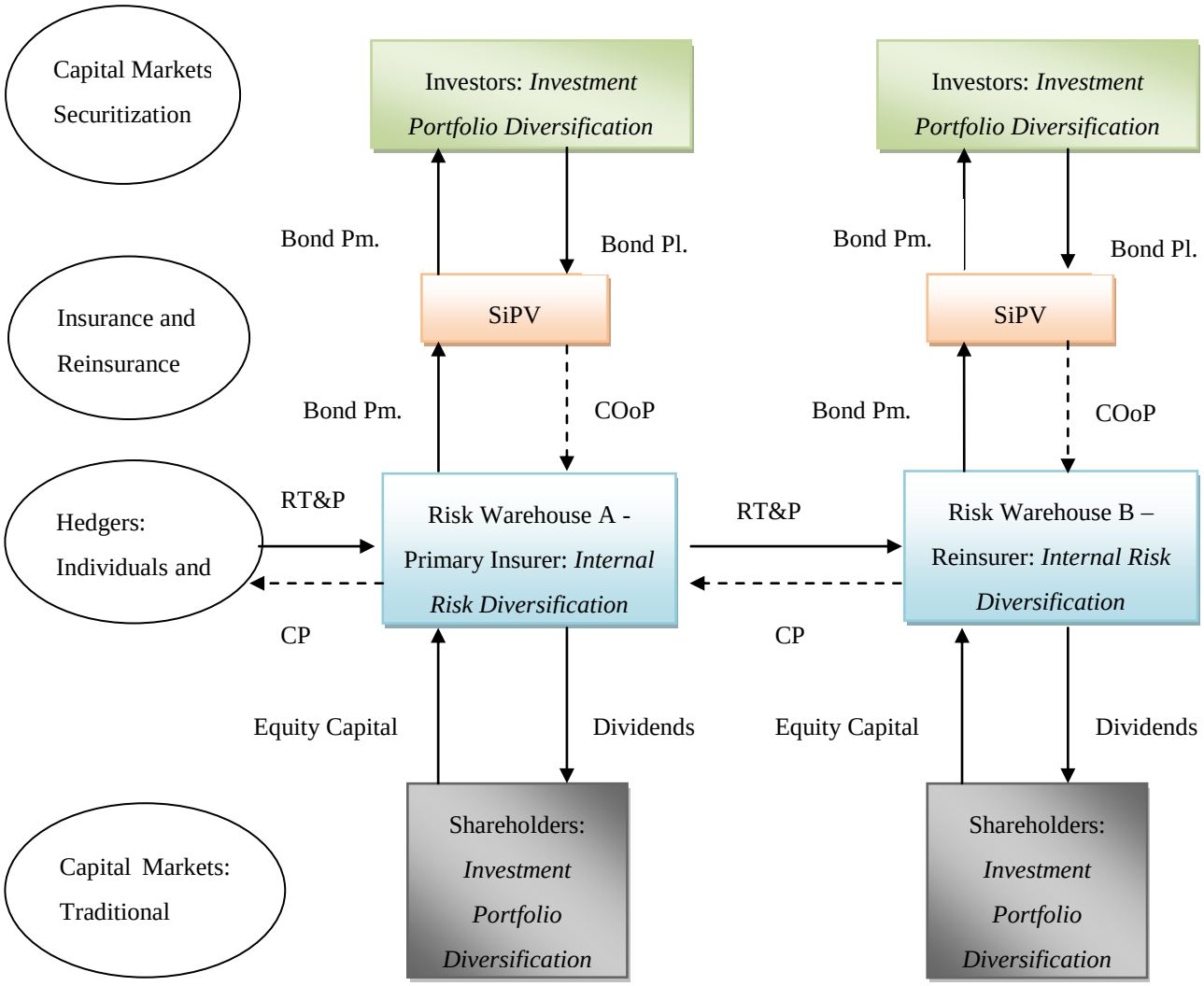
The reinsurance company could be a company which is specialized for reinsurance business, like Munich Re, Swiss Re, Hannover RE or Lloyd´s of London, or another company from insurance business. Moreover, reinsurance companies could be helpful also in other parts of business, especially, in better access to analysis and experience data which help for risk assessment, different taxes and capital regulation in reinsurance market.

The traditional way works safely and efficiently in relatively small, uncorrelated risk and easy and well going information cash flows between insurers and reinsurers with no fundamental problems. But in the moment when risk correlation and potential losses are increasing above sustainable limit, the efficiency of the traditional model starts to disappear and costs of capital grow, is necessary to find some alternative ways for risk transfer to the capital markets - insurance securitization. How is well argued in CEIOPS report, 2009: "*The capital market is well qualified to absorb losses from catastrophe events because of its high capacity and large number of market participants.*"

The insurance securitization still takes up a minor part of whole business, in comparison with traditional way. But after loss events, especially natural disasters such as Hurricane Andrew in 1992 or Hurricane Katrina, Rita and Wilma in 2005, the capital of reinsurers was destroyed and the usual ways of its rebuilding to the previous capacity level were not enough. In this moment the insurance securitization and its tools provide necessary

additional risk capital and become important and still spreading part of insurance risk management business. (Cummins, 2009)[16]

Figure 11: The Mechanism of Reinsurance and Insurance Securitization[17]



Source: Author based on Cummis, (2009)

[16] For more detail, in 2007 natural disasters financial losses were estimated to USD 63, 7 billion which is 90 % of total loss and only 40 % were covered by insurers. (Cummis, 2009)

[17] Where „Bond Pm. = Bond Premium", „Bond Pl. = Bond Principal", „COoP = Call Option on Principal", „SPV = Single Purpose Vehicle", „RT&P = Risk Transfer & Premiums" and „CP = Contingent Payments"

2.5.1.1. Reinsurance

In the Figure 11 is shown almost all[18] possibilities of insurance business. Due to the fact that in the previous chapter is described clearly the securitization process and main players of the process, now I focus on basic cash flows.

In the beginning individuals or any business company use insurer companies (Risk Warehouse A) for hedging insurable risk which hedgers exposed. They transfer the risk and pay payment in exchange with contingent payment when agreed insurance event occurs. Risk Warehouse A accepts risks and holds them on balance sheet. Some part of the risk decreases by diversification, because hedgers´ risks are often statistically independent. With the residual risk Risk Warehouse A could undergo the same process as primary hedgers, in this case we speak about reinsurance, or could hold the risk and diversify it internally. (Cummis, 2009) After internal diversification and reinsurance, the Risk Warehouses still face a problem of residual undiversified risk, because of that we speak about insurance securitization.

2.5.1.2. Insurance Securitization

The top part of the Figure 11 describes the process securitization – insurance securitization – alternative way of risk transfer to capital market. Special Purpose Vehicles[19] issue ILS (Insurance – Linked Securities), as a CAT bond for instance, to investors and obtain funds which they subsequently invest in safe securities. In case of no trigger event the investors receive the principal of the bonds. In the opposite case when trigger event occurs, investors are responsible for the losses, so they receive only some part of their capital or they suffer a

[18] Retroceding, retrocession = a reinsurer hedges the risk in another reinsurance company – is out of the Figure

[19] SPVs re very often established offshore (Bahamas, Cayman Islands) because of tax saving purposes. (CEIOPS, 2009)

total loss. The Risk Warehouses obtains compensatory payment which is defined in the beginning of the contract.

Due to the fact, that investors hold ILS in diversified portfolios composed by other bonds and stocks, they diversify the risk of potential loss and investors are not exposed to whole risk burden from Risk Warehouses (A and B), how it is in traditional internal process[20] (Cummis, 2009).

2.5.1.3. Insurance-Linked Securities (ILSs)

Insurance-linked securities is a general term for financial instruments which pass both – life and non-life insurance risk - on the financial markets. These financial instruments´ values, which have been classified as the most successful securitization structure by far, are driven by trigger events and returns are uncorrelated with the general financial market.

ILS plays the same role in the insurance securitization as ABS in the "basic" forms of securitization described in the chapter above. Against ABSs (especially MBS and CDO) ILSs have some advantages they are less complex and more transparent, the trigger events are briefly specified in the contracts along with simulation of losses and moreover, the trenching structure is more transparent so the investors could estimate faced risk more precisely.

Another reason why investors are seeking for ILSs are high yields. As mentioned in "Insurance Linked Securities Report", CEIOPS, 2009 *"...ILSs, especially CAT bonds yields, are quite high in comparison to stocks and other securities with comparable financial*

[20] „*The stockholders are the ultimate risk bearers or residual claimants in the reinsurance transaction. The stockholders in turn reduce their risks by holding widely diversified portfolios of shares in firms from variol sectors of the economy. Thus, diversification in the traditional (re)insurance enterprise takes place through internal risk pooling, which reduces but does not eliminate the risk of random fluctuations, and through the capital markets, which diversify the residual risk of the risk warehousers across the economy via the mechanism of portfolio diversification by investors.*" (Cummis, 2009)

ratings." However the yields went down very quickly[21] it is still high motivation for new investors. But it is important to keep in mind, that the research of ILSs and insurance securitization is still at the beginning in comparison of ABSs, and it is relatively young research area.

2.5.2. The Accountant View

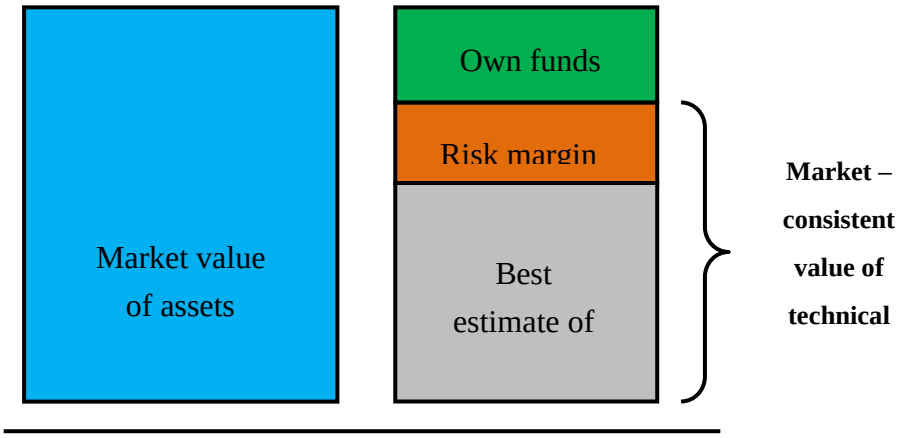
Under Solvency II is required to produce an economic balance sheet representing a risk-based view of the entire balance sheet as at a given time (Mc Hugh, Moormann, 2014) and of course the balance sheet and the assets and liability valuation have to be in accordance with economic principles supervised by International Association of Insurance Supervisors (IAIS).

Assets and liabilities are estimated as market-consistent values where deep, liquid and transparent market is required. There is relatively no problem with assets estimation (sum of potentially receivables are represented on the balance sheet as "recoverable from reinsurance contracts") but on the liabilities side presents a problem.

Liabilities consist of **technical provisions** and **capital - "own funds"**, where technical provisions are a sum of the best estimation of liabilities and risk margin, how is shown in the Figure 12 and own funds ensure the role of balance item. "*To calculate the best estimation of the liabilities, the probability-weighted average of the expected present value of future cash flows based on the risk-free yield curve should be used"* (Mc Hugh, Moormann, 2014).

[21] Yields of the cat bonds have been declining, and they now seem to be priced comparably to reinsurance and BB corporate bonds (CEIOPS, 2009)

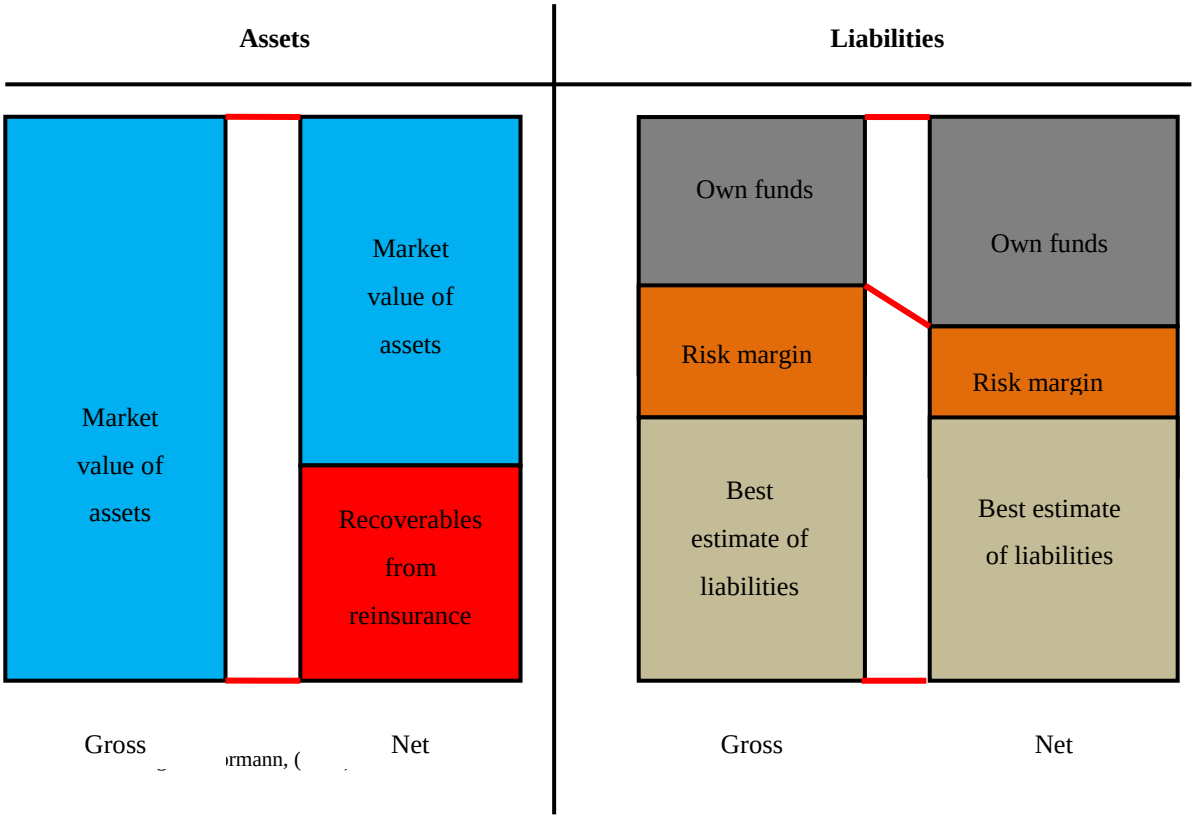
Figure 12: The Balance Sheet of Insurer before Reinsurance



Source: Author based on Mc Hugh, Moormann, (2014)

With the treatment of reinsurance to insurer´s balance sheet occurs several changes. On the asset side the reinsurance is shown as "**recoverables from reinsurance contracts"** which could be for instance reinsurance premiums. On the liability side is reflected in **decreasing of risk margin.** In the Figure 13 is shown the "new" balance sheet – after reinsurance and there is also shown the comparison with the balance sheet before. Gross represents the balance sheet before reinsurance and net represents the new one, after reinsurance.

Figure 13: The Insurer´s Balance Sheet before and after Reinsurance



As mentioned the treatment of reinsurance causes to insurer´s balance sheet two important changes. These are creation of "recoverables from reinsurance contracts" on the asset side and "reducing of margin risk" on the liability side.

- **Recoverables from reinsurance contracts**

There are cash flows between insurers and reinsurers over the term of contract. "*From the perspective of the insurer, it is the expected contribution by the reinsurer to its underwriting liabilities.*" (Mc Hugh, Moormann, 2014) Their volume takes into account expected losses due to default of the counterparty and probability of default of the counterparty and thus their

value is modified. For instance, a good rating of reinsurer usually means smaller adjustments.[22]

- **Risk margin**

Risk margin that together with the best estimation creates technical provisions, represents the capital costs of the non-hedgeable risks. Four risk categories are included in its calculation. These categories are as follow: ***underwritting risk***, ***counterparty default risk*** arising out of reinsurance contracts, ***operational risk*** and finally ***unavoidable market risks***. Reinsurance affects two first – underwriting and counterparty default risk. "*Counterparty default risk increases as a result of the risk of unexpected default by the reinsurer, while reinsurance reduces underwriting risk substantially*." (Mc Hugh, Moormann, 2014)

Counterparty default risk effect could be minimized by choosing good rating reinsurer. Since operational risk is recognized on a gross basis, there is no effect (Mc Hugh, Moormann, 2014). Selection of a good rating reinsurer also produces larger reduction of the risk margin because decreasing effect of underwriting risk is higher than increasing effect of counterparty default risk.

[22] All rules and conditions in Article 81 of the Solvency II Directive

3 Empirical Part

3.1. Italy

3.1.1. Italian Banking Market

Banks plays dominant role of the Italian financial system and main source of finance for the Italian economy. They make 85 % of total financial total assets and they are the most important finance provider to firms, despite the fact that the banking system is small. As mentioned in "The Italian banking system: facts and interpretation" by Riccardo de Bonis et al.: *"With due caution, it can be maintained that the Italian banking system is small because the entire financial system is highly less developed – stock market and corporate bond market are underdeveloped than in other countries – and it has always made them industry dependent on bank market and bank credit*."

Underdevelopment of financial markets in Italy could be given by historical fact – no competitiveness to the United Kingdom, France and Germany in period of market making[23] - but it could also be described by other factors: family controlled firms to keep outside shareholders away; the prevalence of the public pension system, which causes small integration of institutional investors and thus reduction of the potential demand for shares; and the legal system, which does not protect minority shareholders and small investors (De Bonis, 2012).

[23] For more detail – De Bonis et al., 2012, "The Italian banking system: facts and interpretation"

Italian banking market used traditional system that means about 70 % loans to customers and minimum volume of international transactions. Rigidity and no competitiveness of the traditional system has been changed especially by liberalization of branching started around 1990, which leads to the benefit of competition and the increase in mergers and acquisitions (De Bonis, 2012). In spite of many mergers and acquisitions there are still a large number of banks which means a negative impact in terms of relatively low asset concentration, higher only than Germany's in the euro area.

On the other hand, thanks to traditional system and not so high using of structured finance we observed limited impact of financial crisis on the Italian banking system. Besides to the traditional system there are other factors why Italian banks were slightly hit: small proportion of investment banking, competitive disadvantage mentioned above, strict control of securitization due to widely defaults in previous years and minimal foreign inflows to Italian market (De Bonis, 2012).

3.1.1.1. Recent Situation

Predictions about the poor development of the Italian banking market are justified (De Bonis, 2012). For many customers and investors the market becomes illegible, unstable, risky and especially unhealthy. By economic expert unexpected case of UniCredit bank "howler" from March this year – 2014 - more described below confirmed unbalance between statistics and tables with possible reality.

On the paper at least – due to statistics, stress testing, research appears and others official paper, Italian banking system should be one of the Europe's soundest. As mentioned above, Italian banking market generally shunned the "toxic" financial instruments which were destruction for American and German banks. Total assets of bank market are 2.6 times GDP, compared with the euro area where it is 3.2 times.

But reality is not so bright. Economic journals come up with several real problems of Italian banking market:

- Italian banks are dangerously dependent on government bonds, their holding portion of total assets are among the highest in Europe and it was also reason why sovereign debt crisis in 2011 was more devastating than the financial crisis for Italy.

- Bed debts rising annually about 20 % and represents 17 % of GDP (11 % for euro area) or more than 8 % of all bank loans.

- In a case that small Italian firms receive funds they pays higher rates in average about 2 % then elsewhere in the euro area

- Italian banks are the largest user of Long-Term Refinancing Operations, it means Italy is the most reliance on the ECB funding in case of emergency. On the top is holding since last year, when there replaced Spain.

- Slow legal system harms creditors who have no chance for recovering money owed to them. Problem is that Italian banks still stay in contracts with firms that are not able to repay their loans. Result is that about 30 % of Italian firms owed more than 5x if their gross annual earnings.

3.1.1.1.1. The Case of UniCredit

Italian banking group UniCredit reported last year (2013) by analytics and experts unexpected loss 14 billion euros. The reasons were bad loans and large depreciations, which rose up to EUR 9 billion. This huge number of loss is justified by UniCredit's chief executive Mr. Federico Ghizzoni: "We could have staggered the losses over several years. We decided to take them all in one year." (www.bbc.com)

It is one of the biggest losses among European banks since the beginning of the financial crisis. In some countries, including Italy, regulators protected their banks by ignoring their problems including problems with bad loans. It caused that many banks were too weak to lend and creating credit squeeze (www.ft.com). It is more than possible that the European Central Bank´s announcement about more rigorous and deep controls and digs into

books of banks operating across Europe, has spurred a wave of events. The UniCredit´s loss was in fact reported a few hours after the ECB announcement (www.ft.com).

So it comes now the foreshadowing that European banks and other financial institution will have to uncover the full extent of their problems and they will try to solve them by themselves immediately. It is expected there will be more problematic banks and financial institutions in Italy, because Italy belongs to unstable countries after the financial crisis, but also for countries as Germany is not expected smooth course.

The ECB plans to complete all stress tests in October this year, where the main aim is to make sure about correct valuation assets like real estate or government bonds in their portfolios, and that the banks put aside enough funds to cover future possible losses. It is therefore expected that banks has been written off most of problematic assets in period April, 2014 – September, 2014. This purification could only help to Europe (www.nytimes.com).

As mentioned above, Italian banking group UniCredit reported last year (2013) unexpected loss EUR 14 billion, caused especially by loans and large depreciations, which rose up to EUR 9 billion. But the loss was partly mitigated by net capital gain recorded from revaluation of 22 % stake of UniCredit in the Bank of Italy, which is EUR 1.2 billion.

Under the five year restructuring plan there is counted with 8,500 job cuts by 2018 - nearly 6 % of its workforce – where 5,700 in Italy. It also contains investment of EUR 4.5 billion to grow revenues and to cut an additional EUR 1.3 billion in costs. Moreover is expected a EUR 2 billion net profit in 2014, for the year 2018 is expected even more than three times larger – EUR 6.6 billion. The ambitious plan in 2018 is also reflected in 13 % level of return on tangible equity (ROTE). Throughout the plan UniCredit aims to maintain Core Tier 1 ratio to 10 %. According to the words of UniCredit's chief executive Mr. Federico Ghizzoni “The strategic plan is based on solid fundamentals, a strong risk culture and an improving macro-economic climate." (www.uk.reuters.com)

3.1.2. Italian Insurance Market

Italian insurance market belongs to the largest and mature markets around the world and Europe also. In the world scale holds seventh place, in Europe fourth place behind the United Kingdom, France and Germany. Italian insurance market is very well-developed, since 1991 it has grown by 7 % annually, especially supported by growth in the life market which now represents more around 70 % of whole Italian market (68 % in 2011) in comparison with 1991, where represented 27 % (Swiss Re, 2012) and still keeps the growth potential. In spite of difficulties that occurred during years 2011, 2012 described below, was able to establish new growth especially thanks to life insurance market. Italian insurance market takes a strong liquidity position compared to other European competitors and it faces high demand for traditional products.

After a financial turmoil on the insurance market the gross written premium rapidly declines and the recession has continued very well. But in the second half of 2012 thanks to the improvement in financial markets the performances of the Italian gross written premium were forecasted to increase after two consecutive years of decline and it really happened.

This return of growth was observable primary on the life market, where after sharp downfall in 2011 (-18 %) and slighter decrease in 2012 (-5.5 %) became growth by 20.2 %, which was actually assumed by Italian Association of Insurance Companies (ANIA) (Swiss Re, 2012). On the contrary, on the non-life insurance market similar development not occurred. Non-life insurance market is still affected by economic recession and the expectations for future remain same.

Despite the relevance and the growth potential of Italian insurance market, the global economic crisis and Italian debt position hinder Italian industry recovery. Italian insurance institutions are strongly dependent on Italian sovereign debt and up paternalistic behavior of Italian government which provide significant support to its citizens (Swiss Re, 2012). As a result causes creating low level of need for private property, accident and health insurance so

protection products, long-term and health products play secondary role. (PwC, 2013) So obviously insurers´ profitability is damped.

3.2. Variables

Empirical research in this area is a little complicated because of asymmetry of data availability. Also I am aware of that literature is mainly concentrated on bank and insurer market separately, due to these two facts my work goes harder way, but I believe that interesting and beneficial way.

Selection of variables is one of the most important parts in terms of quality of the research, but it also must take into account their availability. Explanatory variables are divided to three parts. The first one, according to several literature sources, bank and insurer specific variables, the second part is characterized by macroeconomic variables for both markets and finally, the third part I will use spreads of 5 years senior CDS of Italian banks, which are considered as the most liquid. As a dependent variable will be changes in volume of securitization and changes in volume of reinsurance, two keys variables of this work.

Data of CDS spreads were downloaded from Bloomberg database in a daily frequency and for required quarterly frequency were transformed by averaging the quarterly period[24]. The other banking variables were collected from publicly available sources mostly from annual reports. Dataset for insurance companies were collected from on-line catalog www.infobila.ania.it, web application with aims to provide time series of data and information about the Italian insurer market. As the second insurer source of information I used personal tables provided by Prof. Maurizio Pompella from University of Siena. Other necessary variables were collected without problem from world bank´s database and Bloomberg database.

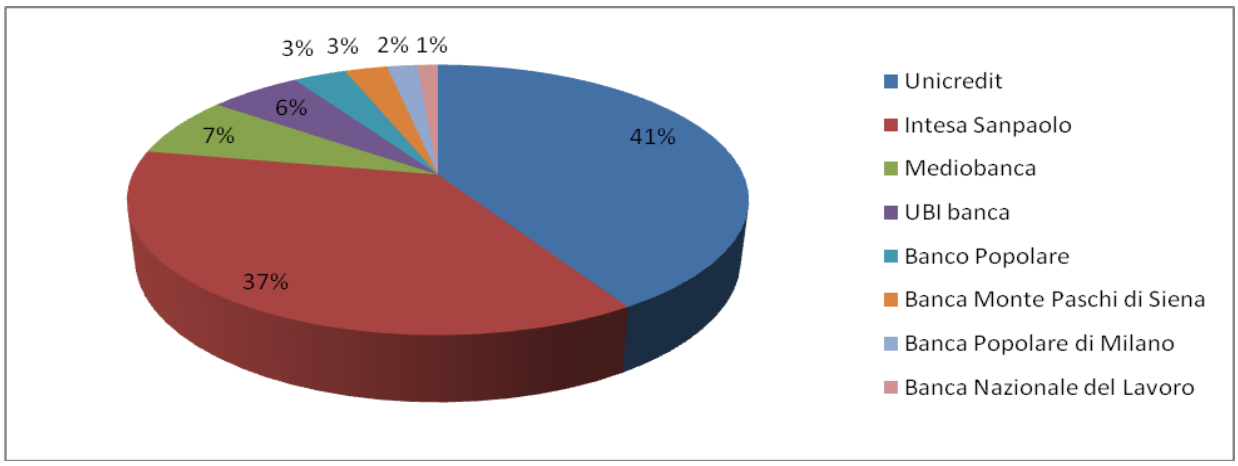
[24] Quarterly frequency was chosen as the best one possibility due to the fact of data availability and their frequency.

Initially, I collected data from Top 10 largest representatives of both markets, but because of the availability of CDS spreads I adjusted them for Top 8. These institutions are namely described below.

3.2.1. Selected Banks

The banking market is represented by 8 Italian banks in Italy and I focused on ten largest banks by market capitalization, but because of data availability of CDS spreads I use eight of them. First seven, namely UniCredit, Intesa Sanpaolo, Mediobanca, UBI banca, Banco Popolare, Banca Monte Paschi di Siena and Banca Popolare di Milano correspond to market capitalization, the eight was added Banca Nazionale del Lavoro (BNL). Their distribution is shown in the Figure 14.

Figure 14: Top 8 Italian Banks



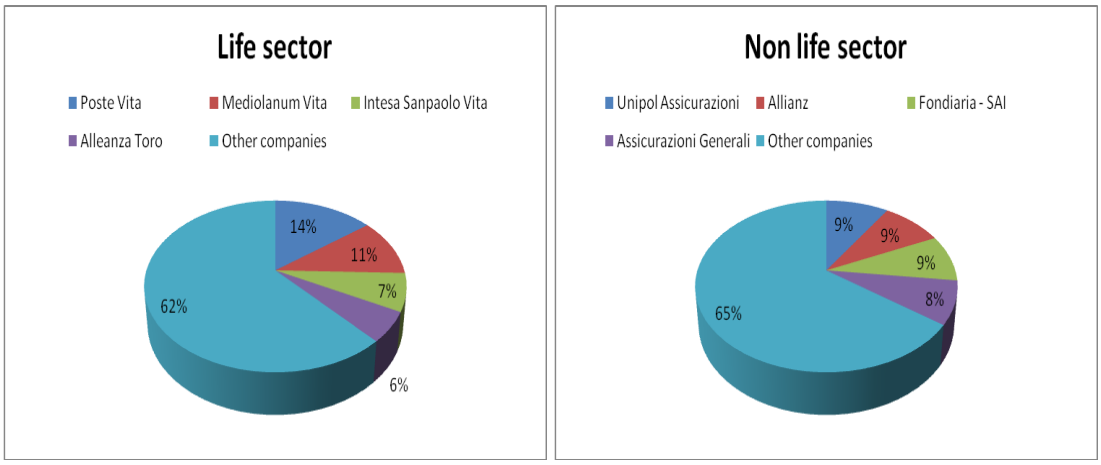
Source: Author based on banks´reports

I could note that to the eight selected banks and therefore to the whole market dominate two banks - UniCredit and Intesa Sanpaolo - their market capitalization reach EUR 32.5 billion, EUR 28.9 billion, respectively. Other banks do not even reach EUR 10 billion. The largest from them is Mediobanca with EUR 5.7 billion.

3.2.2. Selected Insurers

In order to have the same observations of banks and insurance companies I chose eight largest insurers operating in the Italian insurance market – four from life sector (Poste Vita, Mediolanum Vita, Intesa Sanpaolo Vita, Alleanza Toro) and four from non-life sector (Assicurazioni Generali, Unipol Assicurazioni, Allianz, Fondiaria – SAI). Their selection is based on summary presentation from by PwC, September 2013 "The Italian Insurance Market". Selected institutions and their market shares are shown in the Figure 15.

Figure 15: Top 8 Italian Insurance Companies



Source: Author based on PwC, (2013)

I took into account the fact that a lot of insurance companies operate in a both sectors – life and non-life – I have considered the financial information which were managed by the right sector in which for this research the company is occurring.

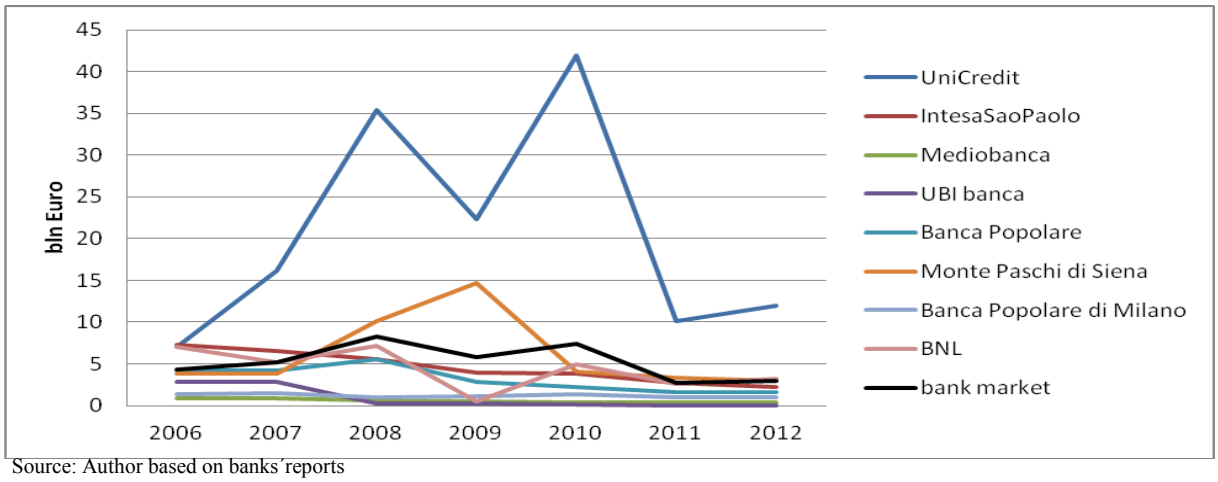
3.2.3. Dependent Variables

As dependent variables occur the volume of securitization in a case of banks and the volume of reinsurance for insurance companies. Their theory and mechanism was discussed adequately in the Chapter 2, their development in Italian market I describe now.

3.2.3.1. Securitization

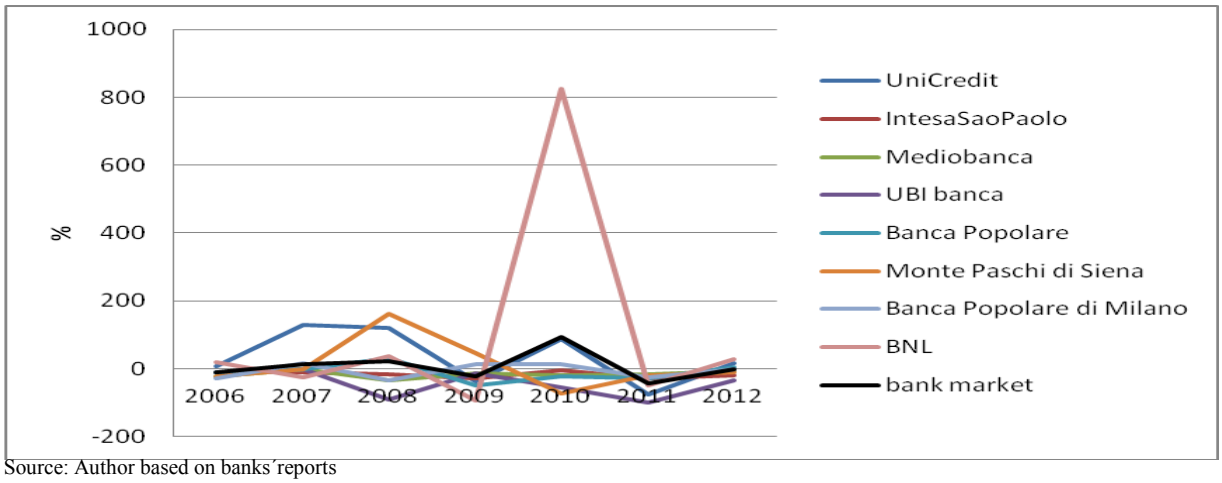
Although, as written above Italian banks were trying to avoid "toxic" finance, the Figure 16 shows that volume of securitization is relatively high and its using increases during the financial crisis mainly for two largest banks UniCredit and Monte Paschi di Siena. Also these two banks are above the average during the period from half of 2007 to end of 2010. UniCredit keeps above the average, represented by the black line, throughout the whole reporting period. If I am interested in the overall market, I see increased volume of securitization during the financial crisis. The greatest change – drop - recorded UniCredit in 2011, at a time of the sovereign crisis. It is good to point out to a fact that all representative banks reached their minimum in this year despite different development throughout the reporting period. The changes of volume of securitization are shown in the Figure 17.

Figure 16: The Volume of Securitization



Source: Author based on banks´reports

Figure 17: Changes of the Volume of Securitization



Source: Author based on banks´reports

For the first side is noticeable extremely behavior of BNL in 2010, which may be associated with preparation for new capital and liquidity requirements issued by Basel Committee in late 2010. The changes of whole market (the black line) have no common trend, generally I could say that the greatest drop is recorded in 2011 in the time of a sovereign crisis. Beside BNL, significant changes recorded the largest Italian bank UniCredit and Monte Paschi di Siena, which mainly in the beginning of the financial crisis rapid rise almost twice, after 2008 both of them fell down, UniCredit little steeper. In the contrast to Monte Paschi di Siena, UniCredit fell down twice, the first drop recorded immediately in follow year in 2009 and after a new wave of growth in follow year fell down again in 2011. Then new groeth did not come.

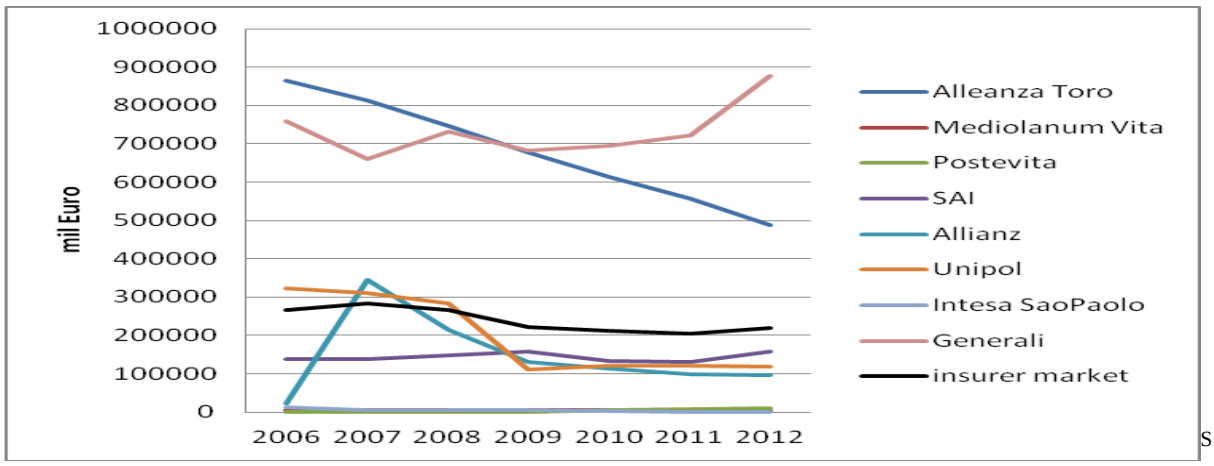
How this fact influences nowadays problems of UniCredit I could only guess but generally I could say that necessary amount of securitization has to be replaced by another financial instruments used for rising capital and for trading or secondly the UniCredit area is healthy and huge amount of replacing is not necessary. The answer is in this moment to the reader. In contrast, Monte Paschi di Siena maximum drop recorded during two years from 2008 to 2010 after that it goes slightly up, it means increasing in securitization. Trend of the entire market has no significant changes - decline or increase – except the year 2010 where the growth is influenced only by one bank, by BNL.

3.2.3.2. Reinsurance

The volume of the reinsurance is in many forms similar to the securitization development – see the Figure 18. Firstly, two insurer companies Generali and Alleanza Toro lies above the development of insurance market (the black line), secondly development of individual insurer companies is differently during the whole period. Thirdly, development of banking market and insurance market records through minimum changes.

Two mentioned insurance companies Generali and Alleanza Toro recorded very different development in years 2009 – 2012 that could be given by the fact that in this research both of them take a place in another kind of sector. The changes in volume of reinsurance are show in the Figures 19.

Figure 18: The Volume of Reinsurance



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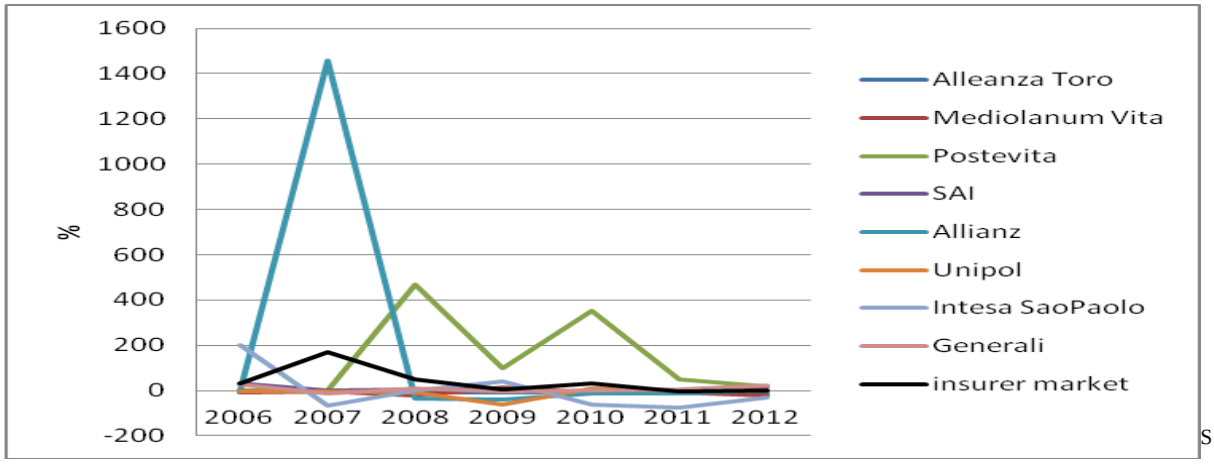
ource: Author based on www.infobila.ania.it

Figure 19: Changes of the Volume of Reinsurance



Source: Author based on www.infobila.ania.it

Also here are noted some similarities with the securitization market, one insurance company has a rapid growth - Alleanza Toro in 2007. After a large increase came a steep fall and since that point, no huge fluctuation comes. Second significant change was observed for Poste Vita, where during the financial crisis period there were ups and downs regularly each year. That produces non stable market. As a stable institution I take Generali because of minimum fluctuations. Also the development of the whole market is similar to the securitization market mostly constant trend is recorded except one year 2007, that is caused by above mentioned Alleanza Toro.

3.2.4. Explanatory Variables

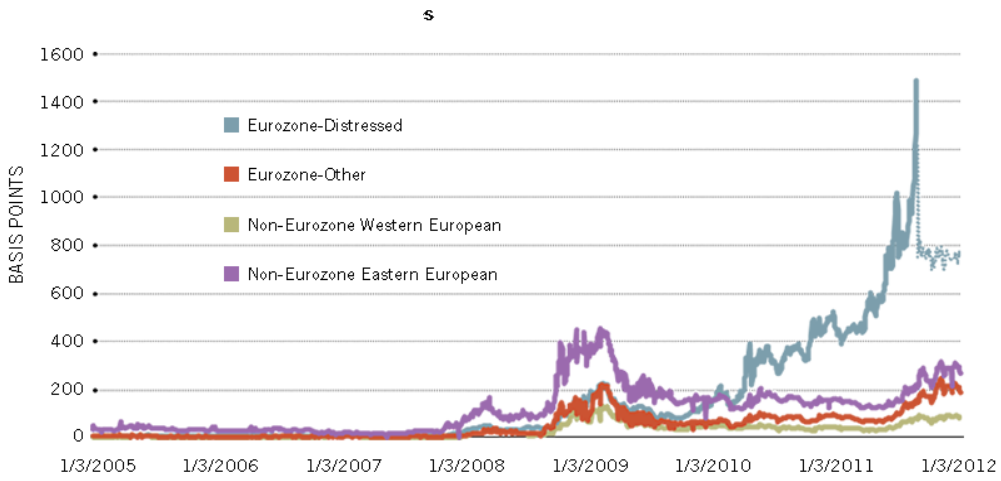
3.2.4.1. CDS spreads

The theory of CDS and CDS spreads is widely available in the literature, like the study "Credit Default Swap and their Role in the Credit Risk Market" by E. Angelini, and moreover

their use for risk transfer is described in this work in the Chapter 2, so further detailed description I will not discuss here, I note only parts directly related to our work.

How is clear from the theory, protection buyer pays a premium to protection seller, who in a case of event agreed in advance – "trigger event" - covers the loss of the buyer. The premium is called spread and it is given in basis points and it could be understood as a price depends on the development of the event. CDS spreads have a direct proportional relationship with the risk associated by the market/investors to the underlying assets. In a case of unfavorable news, that means higher probability of default, CDS spread is increasing – price of the risk is increasing, CDS seller, who in a case of trigger event occurrence covers the swap, pushes the CDS spreads up. In a case of favorable news, the CDS spreads is decreasing. Development of CDS spreads in Europe during reference period is seen in the Figure 20.

Figure 20: Five – Year Spreads on Credit Default Swaps



Source: www.stlouisfed.org

In the beginning of crisis period in 2008, the CDS spreads increase in the whole Europe regardless of whether I speak about countries in Eurozone or not, or about countries

with high government debt – Eurozone Distressed – or not. Their distribution is stated in the Table 3[25].

Table 3: The Distribution of Eurozone Members

Eurozone - Distressed	**ITALY**, Portugal, Ireland, Greece, Spain, Cyprus
Eurozone – other	Austria, Belgium, Estonia, Finland, France, Germany, Malta, Netherlands, Slovak Republic, Slovenia
Non Eurozone Western European	UK, Sweden, Norway, Denmark
Non Eurozone Eastern European	Poland, Hungary, Russia, Latvia, Romania, Czech Republic, Croatia, Lithuania, Bulgarian

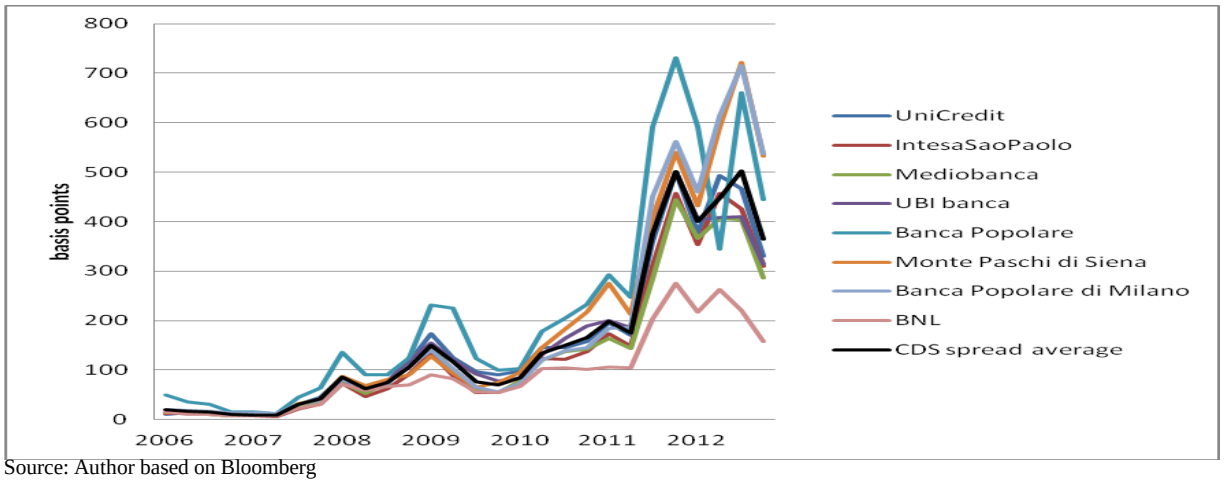
Source: Author based on www.stlouisfed.org

This trend continues in following years, but the increase is slightly larger especially for Non-Eurozone Eastern countries because of large reliance on foreign cash flows how is mentioned on www.stlouisfed.org. After the financial crisis period investors were very careful and therefore CDS spreads increased. A rapid growth were recorded primarily by countries pay with euro, including Italy, and during following three years their maximum had been increasing and reached the top in the turn of years 2011 and 2012. These countries have relatively elevated debt levels, and investors have little faith in the countries' abilities to service their debt obligations. In the beginning of 2010, a role of leader take over Eurozone Distressed countries and their CDS spreads finished many times higher than for other groups, although it was not like that initially.

[25] *„ The Eurozone is made up of the 17 countries that are members of the EU and that use the euro as their currency. The Figure and table do not take into Mount Eurozone member Luxembourg because of its small size. Some of the non-eurozone countries in the table do not belong to the EU. The Eurozone-Distressed countries are viewed as having excessive debt burdens." (www.stlouisfed.org)*

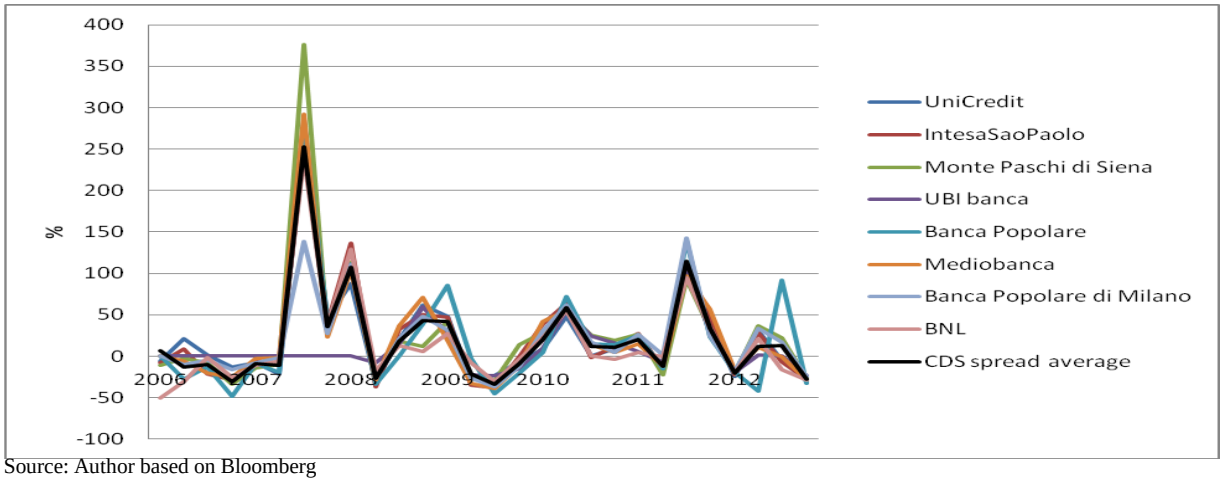
The development of CDS spreads of the representative panel of banks and their changes are shown in the Figure 21 and the Figure 22.

Figure 21: CDS Spreads



Source: Author based on Bloomberg

Figure 22: Changes of CDS Spreads



Source: Author based on Bloomberg

The largest percentage increase as expected came in the beginning of the financial crisis between years 2007 and 2008. The rapid increase is recorded completely for all banks except UBI bank because of non data availability in this time period.

Due to the fact that I have several data sources with different frequencies I decided to transform, where it is necessary, to quarterly frequency. I modified them as follow: from daily

frequency I averaged the data relevant to a given quarter, annual data I used as a quarterly, due to the fact that for that kind of data this approach is possible.

3.2.4.2. Specific Variables of Banks and Insurers

In this section I follow the widely used explanatory bank-specific and insurer-specific factors in many researchers. As an outline I took the group of factors which cover general risk factors and are known as CAMELS bank risk factors. **C**apital adequacy, **A**ssets, **M**anagement capability, **E**arnings, **L**iquidity, sometime added by **S**ensitivity to market but till now it was not applicable to credit union, how is described in World Council of Credit Unions, 2012. Final explanatory variables and their proxies are shown in the Table 4.

Table 4: Selected Proxies of CAMEL Explanatory Variables

Factor	**Selected proxy**
Capital adequacy	Equity to total ratio
Assets	Logarithm of total assets
Management capability	Cost to income ratio
Earnings	Return on average assets Return on average equity
Liquidity	Net loan to total assets

Source: Author based on Sinkey, (1980)

Capital adequacy is often measured directly by Basel capital ratio, but because of necessity including also insurance market and also better data availability a proxy **equity to total assets ratio** which is easily computable from balance sheets was chosen. The ratio reflects the level of company´s indebtedness and exhibit an inverse relationship with company ´s leverage - the lower the value of ratio – the greater the leverage. In a case of decreasing equity (constant total assets) the level of indebtedness is increasing.

Asset quality is a function of presence conditions and possibility of future up and downs and it strongly influence bank´s performance. As a proxy a **logarithm of total assets** was chosen.

Cost to income ratio is a proxy of management quality and is not measure only for company efficiency but it plays important role in strategic planning, internal controls and reflect adequacy of companies´ policies and procedures (WOCCU, 2012). Because of that it is an important and key ratio.

Return on assets (ROA) is an indicator of the return company´s investment and shows company´s profitability. For the research was included also second proxy – Return on Equity. I assume small correlation between them but I use both of them in the beginning and choose better one during the process.

Harder part for data availability was part of liquidity factor. Finally **net loans to total assets ratio** was chosen. This ratio specifies how many company´s asset (in percentage) tied up in loans. Higher ratio (more assets tied up in loans) indicates lower liquidity.

The banking and insurance specific variables were supplemented by macroeconomic variables shown in the Table 5. Their selection is based on article "Determinants of European Bank CDS spreads in Time of Crisis" by Samaniego-Medina et al. and that explanatory which were recognized as suitable due to a work´s topic.

Table 5: Bank´s and Insurer´s Macroeconomic Specific Variables

Name of the factor	Source of the data	Name of the factor	Source of the data
GDP growth (%)	Worldbank database	Central bank assets to GDP (%)	Worldbank database
Inflation (%)	Worldbank database	Life insurance premium volume to GDP (%)	Worldbank database
Stoxx 600 insurance index	Bloomberg	Nonlife insurance premium volume to GDP (%)	Worldbank database
Stoxx 600 bank index	Bloomberg	Domestic provided by banking sector to GDP (%)	Worldbank database
Insurance company assets to GDP (%)	Worldbank database	External loans and deposits of reporting banks vis a vis all sector to GDP (%)	Worldbank database

Source: Author based on www.worldbank.org

3.3. Methodology

3.3.1. Theory

The panel data belongs to multi-level equation systems where a large number of variables are observed in the time sequence. For such datasets there is a combination of cross-sectional information with the time one and these kinds of data, where the data file is composed by the time series with length T and m cross-section observed variables, are sometimes called pooled data. The formulation of the system of econometric equations and as the basis of panel data for the model formulation can be generally written as follow:

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ \vdots \\ y_{iT} \end{bmatrix} \quad X_i = \begin{bmatrix} X_{i1}^1 & X_{i1}^2 & .. & X_{i1}^k \\ X_{i2}^1 & X_{i2}^2 & .. & X_{i2}^k \\ \vdots & \vdots & & \vdots \\ X_{iT}^1 & X_{iT}^2 & .. & X_{iT}^k \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \vdots \\ \varepsilon_{iT} \end{bmatrix}$$

where y_i is the vector appropriate to dependent observed variable i in each time t, (t = 1, 2, … ,T) , X_i is the matrix of all explanatory variables j, (j = 1, 2, … , k) for observation i in each time t, (t = 1, 2, … ,T), ε_i je vector appropriate to observation in each time t, (t = 1, 2, … T). In short, it could be written as follow:

$$y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} \quad X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} \quad \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix}$$

where y and ε are vectors mT x 1 and X is matrix mT x k. Then the standard linear model couild be written as follow:

$$y = X\beta + \varepsilon$$

where $\beta = [\beta_1 \ \beta_2 \ \ldots \ \beta_k]'$.

This expression is very universal so in practice are mainly used special cases, including panel data (Cipra, 2008).

3.3.1.1. Panel Data

3.3.1.1.1. The Pooled OLS Model

The pooled OLS model is the simplest approach

$$y_{it} = \alpha_{it} + x_{it}\gamma_{it} + \varepsilon_{it}\,,\ i = 1, 2, \dots, m,\ t = 1, 2, \dots, T$$

It assumes that total residuals are not structuring, we do not consider individuals nor times effects and the residuals are not correlated with the regressors. Simply, the data leaves panel structure and the parameters are estimated by the standard OLS method (Cipra, 2008).

3.3.1.1.2. Panel Data with Fixed Effects

Panel data with fixed effects could be written as follow:

$$y_{it} = \alpha_t + x_{it}\gamma + \varepsilon_{it}\,,$$

$$\varepsilon_{it} \sim \text{iid}\ (0, \sigma^2),\ \ i = 1, 2, \dots, m,\ t = 1, 2, \dots, T$$

where the only distinguish between cross-section units is the intercept. That means that all information, unobserved factors, such as different management, are reflected only in the intercept. The intercept is nonrandom parameter which is estimated like a coefficient β.

3.3.1.1.3. Panel Data with Random Effects

Panel data with random effects is possible to write as follow:

$$y_{it} = \alpha_t + x_{it}\gamma + \omega_{it}\,,$$

$$\omega_{it} = \varepsilon_{it} + \eta_i,\ \eta_i \sim \text{iid}\ (0, \sigma_\alpha^2),\ \ \varepsilon_{it} \sim \text{iid}\ (0, \sigma^2),\ \ i = 1, 2, \dots, m,\ t = 1, 2, \dots, T$$

Panel data with random effects is obviously used for large number of cross-sectional observations that could causes lack of degrees of freedom. Therefore we look at the individual effects as nondependent random variables with the same distribution. Moreover we assume for all i and t, ε_{it} and η_i thes are not dependent random variables and the regressors x_{it} are not correlated with ε_{it} and η_i.

3.3.1.2. Cointegration Analysis

The cointegration analysis is for the greater clarify part of subchapter 4.2.4. hypothesis 3.

3.4. Hypotheses

3.4.1. The Hypothesis 1

For better overview I attach a table with signs and titles of all explanatory variables and dependent variables in Appendix I.

Hypothesis 1: CDS spreads are negatively correlated with the volume of securitization

My first hypothesis deals with the relationship between the volume of securitization and CDS spreads, in which I argue that CDS spreads are negatively correlated with the volume of securitization, and significance of their relationship. I set up my

hypothesis on the development of two main variables: Issuance of securitization described in the Chapter 3 and development of CDS spreads described in the same chapter.

Development of CDS spreads on the Italian banking market fully complies with development in Europe. Both of these markets have a growing character throughout the observation period, but on the contrary the securitization market behaves a little differently. In Europe its maximum and boom came in 2008, after that it slightly decreased. In Italy the beginning of the running was same but after 2008 some fluctuations appeared. Generally I could say that held declining trend as well as European market but with a lot of ups and downs. The increase in 2010, a sharp fall in the following year and then slightly increase again on 2012. Just in this period up and downs in Europe and Italy led to the most striking growth of CDS spreads, described in the Chapter 3. I set up my hypothesis primarily on general trends after 2008 and I say that CDS spreads are negatively correlated with the volume of securitization.

Due to the fact that I collected data from 8 Italian bank for 7 years in quarterly frequency, m=8 and T=28, I use panel data. Due to the selection of specific and concrete observed entities that represent Italian banking market but are not selected randomly from a wider area of subjects (Italian banks) but fixed, and also because of short time series I assume panel data with fixed effects will be used.

Firstly, I must realize that the dependent variable volume of securitization, explanatory variables CDS spreads and its lags which are included into a model are given in different units and especially in different jurisdictions. CDS spreads and their lags are in basis points, the volume of securitization in EUR million. Other data are predominantly in percentage so it is necessary to modify them.

Therefore as a dependent variable I use logarithm of the volume of securitization and I add logarithm of CDS spreads and their lags (CDS spreads in time t and t-1) among explanatory variables. Moreover, no CDS spreads data available for UBI Bank in years 2006, 2007 as mentioned above, means for us two

possible ways. A model 1a covers all eight banks but in time period 2008 – 2012, a model 1b covers only 7 bank but for whole period 2006 – 2012.

3.4.1.1. Model 1a

Model 1a includes all 8 banks in period of time 2008 – 2012.

3.4.1.1.1. Fixed Effects

At first I have done a model with fixed effects, because of the reasons mentioned above. Immediately was omitted from the model explanatory variable EL_to_GDP because of exact collinearity, then I gradually excluded explanatory variables, which were not significant for the model, namely Inflation, Domestic_BS and finally C_to_I ratio. The final model is shown below.

Table 6: Model 1a: Fixed – effects, dependent variables: l_secu

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	-10.3666	6.55931	-1.5804	0.11636	
log_TA	1.72227	0.481011	3.5805	0.00048	***
E_to_TA	0.375418	0.0794476	4.7253	<0.00001	***
ROE	-0.0747558	0.0202742	-3.6872	0.00033	***
ROA	0.654883	0.28605	2.2894	0.02362	**
NL_to_TA	-0.0822394	0.0200518	-4.1013	0.00007	***
GDP_growth	0.271941	0.111216	2.4452	0.01578	**
Stoxx_600_bank	0.0189428	0.00708573	2.6734	0.00844	***
CBA_to_GDP	0.703532	0.175709	4.0040	0.00010	***
l_CDS_spread	1.72059	0.563026	3.0560	0.00271	***
l_CDS_spread_1	1.11511	0.415341	2.6848	0.00817	***

Mean dependent var	20.97577		S.D. dependent var	2.399551
Sum squared resid	514.4465		S.E. of regression	1.959376
R-squared	0.408298		Adjusted R-squared	0.333231
F(17, 134)	5.439136		P-value(F)	4.30e-09
Log-likelihood	-308.3387		Akaike criterion	652.6774
Schwarz criterion	707.1072		Hannan-Quinn	674.7887
Rho	0.202813		Durbin-Watson	1.581727

Source: Author based on Gretl

Because of the fact that only four variables were removed during the process I could say that explanatory variables were chosen well. The CDS spreads in this model belongs to high significant variable that could be determined from its low p-value (0.00271) or by auxiliary three stars marking in the right column. According to the estimated coefficient β (β=1.72059) I could conclude that both variables are positively correlated and moreover growth of the volume of securitization is higher – faster – than growth of CDS spreads, that means very steep slope of regression line or simply said - $\beta > 1$. It means if CDS spreads increased by 1, then volume of securitization increased by 1.72. But the whole model has not high significance, only 41 %, that is not tragic number, but it does not reach a satisfactory level. Also lags of l_CDS_spreads in t-1 are significant and have similar behavior as l_CDS_spreads itself.

Moreover I am interested in results of the F test and the test of normality of residuals. How is shown in the Table 7, the null hypothesis in the F test represents the pooled OLS model against the alternative hypothesis which represents the use of fixed effects. Because of high p-value of the statistics I could not reject the null hypothesis at the 5 % level of significance, so it means neither at the 1 % level of significance, and therefore I could not reject the use of pooled OLS model, residuals are normally distributed (see Appendix II).

Table 7: Null and Alternative Hypotheses of the F test, the LM test and the Hausman test

Test	H_0	H_A
F-test	Pooled OLS model	Fixed effects
LM test	Pooled OLS model	Random effects
Hausman test	Random effects	Fixed effects

Source: Author based on Gretl

Furthermore, I focus on possibility of autocorrelation. If the Durbin – Watson test is close to 2, I can reject the presence of autocorrelation. The values around 1 and under, and about 3 and higher mean apparent positive / negative autocorrelation. In our case with value 1.58 I assume a moderate positive autocorrelation. This problem

could be solved in many different ways, the most elegant and very often used method is to include lags of dependent variable. Then I solve problem with heteroscedasticity. Evidence of the heteroscedasticity is solved by using robust standard error. The final model is shown in the Table 8.

Table 8: Model 1a: Fixed-effects, dependent variable: l_secu, robust standard errors

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	-21.4746	4.71526	-4.5543	0.00001	***
log_TA	1.57234	0.301053	5.2228	<0.00001	***
E_to_TA	0.52825	0.0685264	7.7087	<0.00001	***
C_to_I	0.021345	0.0108474	1.9678	0.05152	*
ROE	-0.0841265	0.00650269	-12.9372	<0.00001	***
ROA	0.442038	0.107731	4.1032	0.00008	***
NL_to_TA	-0.103513	0.0106335	-9.7347	<0.00001	***
GDP_growth	0.301782	0.09616	3.1383	0.00216	***
Stoxx_600_bank	0.0237557	0.00385517	6.1621	<0.00001	***
CBA_to_GDP	0.92148	0.0778968	11.8295	<0.00001	***
l_CDS_spread	2.25528	0.171462	13.1532	<0.00001	***
l_CDS_spread_1	1.12865	0.440028	2.5650	0.01162	**
l_secu_1	0.216648	0.0245478	8.8255	<0.00001	***
l_secu_2	0.200684	0.023924	8.3884	<0.00001	***
l_secu_3	-0.170577	0.0342085	-4.9864	<0.00001	***

Mean dependent var	20.70426		S.D. dependent var	2.381296
Sum squared resid	442.3808		S.E. of regression	1.969907
R-squared	0.422123		Adjusted R-squared	0.315671
F(21, 114)	3.965412		P-value(F)	9.09e-07
Log-likelihood	-273.1827		Akaike criterion	590.3655
Schwarz criterion	654.4439		Hannan-Quinn	616.4053
Rho	-0.038714		Durbin-Watson	2.040359

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

After treatment with autocorrelation and heteroscedasticity problems I reach very similar results. Positive correlation of our observed variables was confirmed, CDS spreads are highly significant, coefficient β get higher (β = 2.26). The growth of the volume of securitization is higher than the growth of CDS spreads, R-squared of the whole model stays unchanged about 40 %. The test of normality of residuals, the

F test and the Breusch –Pagan test confirm previous results and are available in Appendix II.

3.4.1.1.2. The Pooled OLS Model

In the pooled OLS model I proceed by analogy, gradually I excluded the least significant explanatory variables from the model, namely Inflation, Domestic_BS and C_to_I ratio. The final model is shown below.

Table 9: Model 1a: Pooled OLS model, dependent variable: l_secu

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	-9.19081	6.30255	-1.4583	0.14699	
log_TA	1.69512	0.469405	3.6112	0.00042	***
E_to_TA	0.376896	0.0775675	4.8589	<0.00001	***
ROE	-0.0756287	0.0198183	-3.8161	0.00020	***
ROA	0.704159	0.272412	2.5849	0.01076	**
NL_to_TA	-0.0808638	0.0195484	-4.1366	0.00006	***
GDP_growth	0.245865	0.10445	2.3539	0.01996	**
Stoxx_600_bank	0.0190229	0.00685219	2.7762	0.00625	***
CBA_to_GDP	0.685779	0.170726	4.0168	0.00010	***
l_CDS_spread	1.6226	0.539984	3.0049	0.00315	***
l_CDS_spread_1	1.0158	0.386795	2.6262	0.00959	***

Mean dependent var	20.97577		S.D. dependent var	2.399551
Sum squared resid	518.6254		S.E. of regression	1.917862
R-squared	0.403491		Adjusted R-squared	0.361186
F(10, 141)	9.537547		P-value(F)	5.17e-12
Log-likelihood	-308.9536		Akaike criterion	639.9071
Schwarz criterion	673.1698		Hannan-Quinn	653.4196
Rho	0.213980		Durbin-Watson	1.560895

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The pooled OLS model has the same significant value as well as the panel with fixed effects and also the similar behavior of CDS spreads and its lags. Both of them are high significant explanatory variables with similar low p-values. (β=1.6226, β=1.0158 respectively) and therefore the conclusion about the relationship between the volume of securitization and CDS spreads is same – the volume of securitization

and CDS spreads are positively correlated and due to the fact that $\beta > 1$, the volume of securitization grows faster than CDS spreads.

Very important is checked the test of normality of residuals, the F test and moreover the Breusch-Pagan test (testing the same null hypothesis as well as the F test, but against the alternative hypothesis of random effects). The residuals are normally distributed and the F test confirms us the previous result, that I could not reject the null hypothesis at the 5 % level of significance neither at 1 % level of significance, because of high p-value of the statistics so pooled OLS model is adequate. The same result is obtained from the Breusch –Pagan test, which p-value is not too high as for the F test, but the result is same. At 5 %, neither at 1 % level of significance I could not reject the null hypothesis about the use of pooled OLS model. Table with results of all tests is available in Appendix II.

Again, I focus on solving problems of autocorrelation and presence of heteroscedasticity. The final model is shown below:

Table 10: Model 1a: Pooled OLS, dependent variable: l_secu, robust standard errors

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	-19.1718	4.50064	-4.2598	0.00004	***
log_TA	1.48507	0.283318	5.2417	<0.00001	***
E_to_TA	0.515936	0.0666776	7.7378	<0.00001	***
C_to_I	0.0230208	0.0102759	2.2403	0.02690	**
ROE	-0.0820078	0.00622707	-13.1696	<0.00001	***
ROA	0.524555	0.0917085	5.7198	<0.00001	***
NL_to_TA	-0.101076	0.0105256	-9.6029	<0.00001	***
GDP_growth	0.262386	0.0959111	2.7357	0.00716	***
Stoxx_600_bank	0.0234445	0.0034965	6.7051	<0.00001	***
CBA_to_GDP	0.879316	0.074332	11.8296	<0.00001	***
l_CDS_spread	2.07917	0.1617	12.8582	<0.00001	***
l_CDS_spread_1	1.01603	0.43672	2.3265	0.02165	**
l_secu_1	0.221588	0.0267589	8.2809	<0.00001	***
l_secu_2	0.181321	0.0227586	7.9671	<0.00001	***
l_secu_3	-0.162472	0.0314421	-5.1673	<0.00001	***

Mean dependent var	20.70426		S.D. dependent var	2.381296
Sum squared resid	450.0552		S.E. of regression	1.928591
R-squared	0.412098		Adjusted R-squared	0.344076

F(14, 121)	6.058318		P-value(F)	5.96e-09
Log-likelihood	-274.3523		Akaike criterion	578.7046
Schwarz criterion	622.3944		Hannan-Quinn	596.4590
Rho	-0.020528		Durbin-Watson	2.010533

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The effect of treatment of autocorrelation and heteroscedasticity is same as for the panel data with fixed effects. Significance of CDS spreads, positive correlation and whole model significance remain unchanged. The coefficient β increases (β = 2.08). Table with results of all tests is available in Appendix II.

The pooled OLS model was evaluated as the best estimated model, but data in this model are losing the panel data structure and therefore it could be understood as an auxiliary mode. Because I want to keep the panel data structure estimate and stick with GLS estimate I pass Hausman test to decide whether is better used fixed of random effects.

3.4.1.1.3. Random Effects

The large number of explanatory variables reduces degrees of freedom of the regression. Because of that, their number is insufficient in this case for Hausman test, but this problem could be solved by using Stepwise methodology – forward selection. This procedure involves starting with no variables in the model, testing significance of all variables on one´s own, than includes that variable which is the most significant (which makes the model the best). In this case I continue to the end. Finally I find the best model. In case I have more significant models, I use information criteria to decide which model is better.

After Hausman test, where I could not reject the null hypothesis of random effects at the 5 % neither 1 % level of significance, I reach the best model with random effects by Stepwise method. Details of Hausman test are available in Appendix II, for the Stepwise method see Appendix III. Among the most significant variables was not included the most important one for us l_CDS_spread. Therefore I

repeated the process and included the CDS spread in the phase where it reached its highest significance. The final model is shown below:

Table 11: Model 1a: Random effects, dependent variable: l_secu

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	-4.00927	6.04824	-0.6629	0.50840	
l_CDS_spread	1.13639	0.501554	2.2657	0.02487	**
NL_to_TA	-0.0246336	0.0124326	-1.9814	0.04934	**
CBA_to_GDP	0.545321	0.154474	3.5302	0.00055	***
log_TA	2.05329	0.471868	4.3514	0.00002	***
E_to_TA	0.193203	0.0631495	3.0594	0.00262	***
Stoxx_600_bank	0.0161595	0.0065965	2.4497	0.01543	**

Mean dependent var	21.12994		S.D. dependent var	2.434182
Sum squared resid	617.3136		S.E. of regression	2.002131
Log-likelihood	-335.0464		Akaike criterion	684.0929
Schwarz criterion	705.6191		Hannan-Quinn	692.8339

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The panel data with random effects leads to similar results as the pooled OLS model. CDS spreads has good significance and they are positively correlated with the volume of securitization. The coefficient β is 1.14 so the volume of securitization growth faster than CDS spreads.

3.4.1.2. Model 1b

3.4.1.2.1. The Pooled OLS Model

Model 1b covers whole observed period 2006 – 2012, but only with seven banks, UBI was excluded from the panel because of no data availability. Explanatory variables are without changes in comparison to model 1a. Due to the same data structure I assume the same approach, the pooled OLS model, is adequate as well as for the previous model 1a. About correctness of my decision I, of course, convince by the F test and the Breusch-Pagan test.

From the original model with all explanatory variables I gradually excluded the least significant ones, namely Domestic_BS, Stoxx_600_bank and Inflation. The final model is shown below.

Table 12: Model 1b: Pooled OLS model, dependent variable: l_secu

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	1.52882	1.2391	1.2338	0.21891	
log_TA	2.33477	0.117021	19.9517	<0.00001	***
E_to_TA	0.202817	0.0151349	13.4006	<0.00001	***
C_to_I	0.0238898	0.00341769	6.9900	<0.00001	***
ROE	-0.0373034	0.00503165	-7.4138	<0.00001	***
ROA	0.36295	0.0690553	5.2559	<0.00001	***
NL_to_TA	0.0189013	0.0033732	5.6034	<0.00001	***
GDP_growth	-0.0343564	0.0179414	-1.9149	0.05711	*
CBA_to_GDP	0.0644734	0.0172106	3.7461	0.00024	***
EL_to_GDP	0.050066	0.00713803	7.0140	<0.00001	***
l_CDS_spreads	0.176176	0.089895	1.9598	0.05159	*
l_CDS_spreads_	0.103045	0.0484154	2.1284	0.03469	**

Mean dependent var	21.84414		S.D. dependent var	1.129880
Sum squared resid	48.06449		S.E. of regression	0.521105
R-squared	0.799736		Adjusted R-squared	0.787291
F(11, 177)	64.25771		P-value(F)	7.29e-56
Log-likelihood	-138.7897		Akaike criterion	301.5793
Schwarz criterion	340.4803		Hannan-Quinn	317.3390
Rho	0.388725		Durbin-Watson	1.164444

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The model significance increased rapidly to 80 %, that means so good significance and satisfactory level. The CDS spreads and also it lags belong to significant variables but there are not too important as other. Among significant explanatory variables have the highest p-values, together with GDP_growth. As well as in the previous model CDS spreads, also its lags values, are positively correlated with volume of securitization, but their behavior is different because of the fact that coefficient beta lies between 0 and 1 ($0 < \beta < 1$). It means that the regression line grows more slowly and CDS spreads growth “faster” than the volume of

securitization – if CDS spreads rise about 1, the volume of securitization rises only by 0.17.

According the F test and also the Breusch-Pagan test (because of their higher p-values) I do not reject their null hypothesis at 5 % significance level neither at 1 % significance level, therefore the pooled OLS model is adequate, residuals are normally distributed (see Appendix II). As well as for Model 1a I have to solve problems with autocorrelation and heteroscedasticity. After the treatment I reach the final model shown below:

Table 13: Model 1b: Pooled OLS, dependent variable: l_secu, robust standard errors

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	5.28332	0.444223	11.8934	<0.00001	***
log_TA	1.80805	0.0479092	37.7392	<0.00001	***
ROE	-0.0104913	0.00221389	-4.7389	<0.00001	***
ROA	0.108204	0.0218317	4.9563	<0.00001	***
NL_to_TA	0.0406565	0.00240257	16.9221	<0.00001	***
GDP_growth	-0.0143072	0.0053024	-2.6983	0.00771	***
Stoxx_600_bank	0.00196789	0.000582873	3.3762	0.00092	***
CBA_to_GDP	0.0578601	0.00550616	10.5082	<0.00001	***
EL_to_GDP	0.0108164	0.0017017	6.3562	<0.00001	***
l_CDS_spreads	0.0569285	0.0394061	1.4447	0.15048	
l_secu_1	0.358079	0.0373922	9.5763	<0.00001	***
l_secu_2	-0.164436	0.0390957	-4.2060	0.00004	***
l_secu_3	-0.0729562	0.0202633	-3.6004	0.00042	***

Mean dependent var	21.66680		S.D. dependent var	0.968733
Sum squared resid	25.05258		S.E. of regression	0.393250
R-squared	0.846575		Adjusted R-squared	0.835211
F(12, 162)	74.49114		P-value(F)	1.75e-59
Log-likelihood	-78.23095		Akaike criterion	182.4619
Schwarz criterion	223.6041		Hannan-Quinn	199.1504
rho	0.094955		Durbin-Watson	1.595446

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The significance value of the whole model is still around 80 % (R-squared = 84 %), the coefficient β is holding around 0 (β = 0.07), CDS spreads are positively

correlated. Unlike the auxiliary pooled OLS model, CDS spread loses any significance. Details of all tests are available in Appendix II.

3.4.1.1.2. Random Effects

To maintain the panel structure, I pass through Hausman test and at the 5 % neither 1 % level of significance I could not reject the null hypothesis about random effects, detail is available in Appendix II. The final model is shown below, whole process of Stepwise method is in Appendix III.

Table 14: Model 1b: Random effects, dependent variable: l_secu

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	9.07528	0.757721	11.9771	<0.00001	***
log_TA	1.67436	0.0954454	17.5426	<0.00001	***
l_CDS_spreads	-0.0181135	0.0500288	-0.3621	0.71771	
E_to_TA	0.167631	0.0156832	10.6886	<0.00001	***
C_to_I	0.0277348	0.00345789	8.0207	<0.00001	***
EL_to_GDP	0.0276652	0.00627361	4.4098	0.00002	***

Mean dependent var	21.88638		S.D. dependent var	1.133732
Sum squared resid	82.32285		S.E. of regression	0.656513
Log-likelihood	-193.1003		Akaike criterion	398.2006
Schwarz criterion	417.8693		Hannan-Quinn	406.1634

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The panel data with random effect consider CDS spreads as a non-significant variable and they are negatively correlated with the volume of securitization. On the other hand the coefficient β is still around 0 (β = -0.02). Growth or decline of both markets is at a similar fast.

3.4.1.3. Conclusion

As a conclusion of the model 1 and answer for the first hypothesis I could say, that the hypothesis was reject because CDS spreads and the volume of securitization are positively correlated in most models. The only one with different results is the panel data with random effects in a case, where I did not include UBI bank but counted with whole crisis period. This negative correlation is not so strong to call into question previous results.

In case of high significance of CDS spreads, model´s significance level was low, on the contrary the second model have high level of significance but identified CDS spreads as slightly significant explanatory variables and moreover β is close to 0. It could be interpreted as there is a significant and important relationship between observed variables and CDS spreads is a one of the good explanatory variables of the volume securitization but their relationship is strongly dependent on surrounding macroeconomic conditions or the phase of economic cycle.

It could correspond to above-mentioned different behavior of Italian and European securitization market, sovereign crisis that struck Italy in 2011, or recent events on the Italian bank market described in the Chapter 3. Although these events occurred in early 2013, their non-transparency causes lays in the observed period.

3.4.2. The Hypothesis 2

Hypothesis 2: CDS spreads are negatively correlated with the volume of reinsurance

The second hypothesis is similar to the first one but from banking market I move to the insurance market and the volume of reinsurance. A wording of the second

hypothesis is easier because development of CDS spreads and development of volume of reinsurance holds the same trend during the whole observed period. The CDS spreads have increasing trend, the reinsurance market opposite – decreasing trend. In spite of that the reinsurance and structure finance are booming market, Italian market shows a decreasing character and therefore I say that CDS spreads and the volume of reinsurance are negatively correlated.

As well as the securitization, the conditions of model and data structure are same – m=8 and T=28 – I assume the use of the panel model with fixed effects. Moreover, because of all data availability I will investigate only one model, where dependent variables is represented by logarithm of the volume of reinsurance and among explanatory variables are added logarithm of CDS spreads and its lags. CDS spreads are here as an average of the market.

3.4.2.1. Model 2

Model 2 covers all eight insurance companies in the whole period of time 2006 – 2012. For the same reasons as for the model 1 – non-randomness of selection of observations and short times series – I assume the panel model with fixed effects. Furthermore I assume the same process that leads me to the pooled OLS model. My assumption will be, of course, tested by the F test and the Breusch-Pagan test. Because of new dataset I start for beginning.

3.4.2.1.1. Fixed Effects

From the original model with all explanatory variables I gradually remove the ones with the smallest p-value. The first was ROE, followed by log_TA, as the third should be removed l_CDS_spread but due to the fact variable I am the most interested in it, I left it in the model despite its non significance and I removed the second worst one Stoxx_600_Insur instead of it. Furthermore I gradually removed l_CDS_spread_1 (lag of logarithm of CDS spread), ROA, ICA_to_GDP and

Inflation. Finally in the model remained all significant explanatory variables, except l_CDS_spread. But I must note that the p-value of l_CDS_spread is the smallest from all models just in the final one, the p-value is 4.5 times smaller than in the beginning of the process (p-value=0.20728). The final model is shown below.

Table 15: Model 2: Fixed effects, dependent variable: l_rein

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	89.9555	19.4585	4.6229	<0.00001	***
E_to_TA	31.9032	3.26324	9.7765	<0.00001	***
C_to_I	0.00289689	0.000530127	5.4645	<0.00001	***
NL_to_TA	25.0641	6.22859	4.0240	0.00008	***
GDP_growth	0.955347	0.221102	4.3208	0.00002	***
LIP_to_GDP	-3.06431	0.65632	-4.6689	<0.00001	***
NLIP_to_GDP	-32.4849	7.8237	-4.1521	0.00005	***
l_CDS_spread_an	-0.497568	0.393334	-1.2650	0.20728	

Mean dependent var	10.52261		S.D. dependent var	3.366880
Sum squared resid	1152.628		S.E. of regression	2.348396
R-squared	0.544038		Adjusted R-squared	0.513495
F(14, 209)	17.81224		P-value(F)	1.37e-28
Log-likelihood	-501.3154		Akaike criterion	1032.631
Schwarz criterion	1083.806		Hannan-Quinn	1053.287
Rho	0.152645		Durbin-Watson	1.626869

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

During the whole process I excluded quite a lot explanatory variables so their selection was not entirely lucky. The CDS spreads is not significant one but corresponds with our hypothesis and is negatively correlated with the volume of reinsurance. Coefficient β of CDS spreads is estimated for -0.5 it means that decreasing of the volume of reinsurance is lower than growth of CDS spreads. In other words, the regression line is slowly declining. The model has 54 % level of significance.

Due to high p-value of the F test I could not reject the null hypothesis at 5 % neither 1 % level of significance and I examine data with the pooled OLS model, the residuals are normally distributed (see Appendix II).

3.4.2.1.2. The Pooled OLS Model

From the pooled OLS model were excluded same variables in the same order as in the model with fixed effects. The resulting model is shown below.

Table 16: Model 2: Pooled OLS model, dependent variable: l_rein

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	87.3532	18.6821	4.6758	<0.00001	***
E_to_TA	32.2899	3.22345	10.0172	<0.00001	***
C_to_I	0.00277245	0.000520089	5.3307	<0.00001	***
NL_to_TA	24.9746	6.16916	4.0483	0.00007	***
GDP_growth	0.944044	0.218588	4.3188	0.00002	***
LIP_to_GDP	-3.03185	0.649348	-4.6691	<0.00001	***
NLIP_to_GDP	-31.4197	7.49222	-4.1936	0.00004	***
l_CDS_spread_an	-0.44292	0.369485	-1.1988	0.23194	

Mean dependent var	10.52261		S.D. dependent var	3.366880
Sum squared resid	1168.725		S.E. of regression	2.326105
R-squared	0.537670		Adjusted R-squared	0.522687
F(7, 216)	35.88552		P-value(F)	5.36e-33
Log-likelihood	-502.8688		Akaike criterion	1021.738
Schwarz criterion	1049.031		Hannan-Quinn	1032.754
rho	0.163995		Durbin-Watson	1.596229

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

Despite its non-significance l_CDS_spread was remained in the model, but I could again conclude its smallest p-value in the final model. The CDS spreads and the volume of reinsurance are negatively correlated and estimated value of coefficient β is relatively low. As well as for the model with fixed effects coefficient β lies between -1 and 0, the regression line is slightly decreasing so reducing the volume of reinsurance is only 0.44 when CDS spreads grow by 1. Also the significance value of the final model is not changed at all and corresponds to 54 %.

The same results are reached at the F test, where because of high level of its p-value I could not reject the null hypothesis at the 5 % neither 1 % level of significance so I can not reject the use of the pooled OLS model. This decision is

supported with result of the Breusch-Pagan test, the residuals are normally distributed (see Appendix II).

3.4.2.1.3. Robust Standard Errors

After the treatment with autocorrelation and heteroscedasticity problem I reach the final models shown below:

Table 17: Model 2: Fixed effects, dependent variable: l_reins, robust standard errors

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	81.7105	29.2718	2.7914	0.00582	***
E_to_TA	26.8527	0.12152	220.9732	<0.00001	***
C_to_I	0.509121	0.0315353	16.1445	<0.00001	***
ROA	89.3437	6.13463	14.5638	<0.00001	***
NL_to_TA	11.9622	2.40072	4.9828	<0.00001	***
GDP_growth	0.841496	0.276037	3.0485	0.00265	***
Inflation	0.255137	0.114605	2.2262	0.02725	**
ICA_to_GDP	-0.115289	0.018999	-6.0681	<0.00001	***
LIP_to_GDP	-2.34986	0.830845	-2.8283	0.00521	***
NLIP_to_GDP	-30.6361	11.8598	-2.5832	0.01059	**
l_CDS_spread__b	-0.141531	0.489914	-0.2889	0.77300	
l_rein_1	0.129055	0.0338517	3.8124	0.00019	***
l_rein_2	-0.0351723	0.00507535	-6.9300	<0.00001	***
l_rein_3	0.105418	0.0121373	8.6855	<0.00001	***

Mean dependent var	10.16962		S.D. dependent var	3.395790
Sum squared resid	867.5170		S.E. of regression	2.201469
R-squared	0.621955		Adjusted R-squared	0.579715
F(20, 179)	14.72444		P-value(F)	3.79e-28
Log-likelihood	-430.5195		Akaike criterion	903.0390
Schwarz criterion	972.3036		Hannan-Quinn	931.0693
Rho	-0.005206		Durbin-Watson	1.996193

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

Table 18: Model 2: Pooled OLS model, dependent variable: l_rein, robust standard errors

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	81.3708	27.1334	2.9989	0.00308	***
E_to_TA	26.7713	0.127351	210.2174	<0.00001	***
C_to_I	0.510275	0.0348275	14.6515	<0.00001	***
ROA	93.0269	6.68599	13.9137	<0.00001	***
NL_to_TA	11.7516	2.53273	4.6399	<0.00001	***
GDP_growth	0.863057	0.276175	3.1250	0.00206	***
Inflation	0.246974	0.0997379	2.4762	0.01417	**
ICA_to_GDP	-0.118663	0.0147075	-8.0682	<0.00001	***
LIP_to_GDP	-2.40425	0.823007	-2.9213	0.00392	***
NLIP_to_GDP	-30.3813	11.0413	-2.7516	0.00652	***
l_CDS_spread__b	-0.114435	0.383646	-0.2983	0.76582	
l_rein_1	0.132307	0.0337707	3.9178	0.00013	***
l_rein_2	-0.0311451	0.0045442	-6.8538	<0.00001	***
l_rein_3	0.109398	0.0130829	8.3619	<0.00001	***

Mean dependent var	10.16962		S.D. dependent var	3.395790
Sum squared resid	872.4868		S.E. of regression	2.165823
R-squared	0.619789		Adjusted R-squared	0.593216
F(13, 186)	23.32327		P-value(F)	1.84e-32
Log-likelihood	-431.0907		Akaike criterion	890.1814
Schwarz criterion	936.3579		Hannan-Quinn	908.8683
Rho	-0.002328		Durbin-Watson	1.989380

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

In both cases was confirmed non-significance of CDS spreads, the coefficients β were reduced in absolute value, negative correlation with the reinsurance market remain unchanged. Details of all tests are available in Appendix II.

3.4.2.1.4. Random Effects

As in the previous hypothesis I want to keep the panel data structure so based on result of Hausman test (see Appendix II) I conduct the panel data model with random effects. Final model is shown below, whole process of Stepwise method is in Apendix III.

Table 19: Model 2: Random effects, dependent variable: l_rein

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	1.26549	1.98282	0.6382	0.52402	
E_to_TA	31.7345	3.13707	10.1160	<0.00001	***
l_CDS_spread__b	0.945901	0.248001	3.8141	0.00018	***
l_CDS_sprea_1	-0.217022	0.143888	-1.5083	0.13300	
NL_to_TA	16.5322	6.98609	2.3664	0.01887	**
C_to_I	0.475086	0.137699	3.4502	0.00068	***
Inflation	0.370087	0.125037	2.9598	0.00343	***

Mean dependent var	10.40719		S.D. dependent var	3.373855
Sum squared resid	1079.824		S.E. of regression	2.267602
Log-likelihood	-480.2924		Akaike criterion	974.5849
Schwarz criterion	998.2118		Hannan-Quinn	984.1302

Source: Author based on Gretl

Note: The number of stars indicates the significance level: (*) means p<0.1, (**) means p<0.05, (***) means p<0.01

The results of the panel model with random effects are diametrically different from the previous ones. There are reflected the individual effects of observed institutions, but the best CDS spread model does not correspond to the best random effect model. Nevertheless the last model is the best approach of the hypothesis two, so I say, the significance of CDS spreads is very high, but not essential. The sign of correlation is opposite, but the coefficient is still lower than 1 (β= 0.94). I could say, the fast of growth or decline is higher in CDS spread market but the reaction of reinsurance market is not unambiguous (opposite correlation). But with respect the final model selected under many tests I incline to a positive correlation. What the result indicates is the fact, that insurer market should be guarded against financial instruments used for risk transfer. It may seem that insurers do not feel the threat from these markets but their peace is unfounded.

3.4.2.2. Conclusion

Because of results of the last model (the panel data with random effect), I could reject my hypothesis that the CDS spreads and the volume of reinsurance are negatively correlated. I have to say that the development of CDS spreads is very important for

the development of volume of reinsurance. As mentioned above the reinsurance is still spreading and young branch of economics so more significant results could be observed in subsequent years. But I have to say, that it may seem that Italian insurance companies, because of results from the auxiliary pooled OLS model, do not feel the threat coming from the CDS market but how the main model, the panel data with random effect model, of hypothesis 2 shows, this peace is not unfounded and insurance market should be more guarded against financial instruments used to risk transfer.

3.4.3. The Hypothesis 3

Hypothesis 3: Regulatory arbitrage between reinsurance and securitization market is not significant.

Structure finance and finance instruments used for risk transfer, use different regulatory conditions on various markets, are still expanding area in economy. As mentioned above in many cases it is nontransparent relationship and part of economy, because of that have been introduced regulatory conditions in banking and insurance market – described in the Chapter 2 – which prevent allowed me to say to the moral hazard in the field of economic business and mainly they are trying to mitigate and prevent against moments of crisis in economy.

I focus on Italian securitization and Italian reinsurance market and contend that regulatory arbitrage between reinsurance and securitization market is not significant. I am convinced of high probability of arbitrage presence between these two markets, nevertheless my hypothesis is that regulatory arbitrage is not significance. It is because of the regulatory conditions still become tougher. In this

moment is very important question about speed with which the markets return to equilibrium relationship and the strength of their cointegration. I also contend that the boundary between presence and lack of cointegration is very thin.

In the most cases we have combination of two linear non stationary time series and this combination is also nonstationary. In a particular cases the unit roots, which causes the nonstationarity, could cancel out each other´s effects and random component could be stationary – I(0). In this case the time series are cointegrated.

Firstly it is important to define the time series. Due to the fact, that the previous hypotheses I used panel data structure which is not suitable here, I define two indices, the index of securitization market and the index of reinsurance market, whose relationship I will examine. Each of these two indices is created by summing the volume of securitization and the volume of reinsurance of Top 8 relevant institutions (banks and reinsurance). Throughout the whole research of hypothesis 3, I will use their logarithms and software Gretl.

To be able to examine and consider the cointegration between two observed time series, due to definition is clear, these time series must be non-stationary. For testing the nonstationarity I use Dickey-Fuller test a KPSS test. Their connection is sometimes called confirmatory data analysis (Cipra, 2008).

I use both of above mentioned tests. The null hypothesis of the Dickey – Fuller test (the DF test) is a presence of the unit root, in other words $\alpha = 1$, against one side alternative hypothesis that $\alpha<1$. The Kwiatkowski-Phillips-Schmidt-Shin test (the KPSS test) conversely accepts the stationarity as the null hypothesis and a presence of the unit root as the alternative one. Their null and alternative hypothesis and all their combination are shown in the Table 20.

Table 20: The DF test and the KPSS test

	DF – test	**KPSS - test**
H_0	y_t - I(1)	y_t - I(0)
H_A	y_t - I(0)	y_t - I(1)
RESULTS		
H_0 of DF test is rejected	H_0 of KPSS test could not be rejected	evident stationarity
H_0 of DF test could not be rejected	H_0 of KPSS test is rejected	evident nonstationarity
H_0 of DF test is rejected	H_0 of KPSS test is rejected	not possible to decide
H_0 of DF test could not be rejected	H_0 of KPSS test could not be rejected	not possible to decide

Source: Author based on Cipra, (2008)

The DF test could be used only if the residuals ε_t is a white noise. Moreover, if I face to problems with autocorrelation, which are not sufficiently taking into account in the model, the use of the DF test is impossible, because it can cause higher probability of rejection of the null hypothesis than is the given significance level. These problems are solved by the Augmented Dickey – Fuller test (the ADF test), where the estimated equation is extended by p lags. The Augmented Dickey- Fuller test form is follow:

$$\Delta y_t = \phi y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \epsilon_t$$

Moreover, the DF test does not have sufficient power in cases where characteristic unit root of time series is in absolute value close to 1. And because the null hypothesis is a presence of the unit root is recommended, as mentioned above, to do the KPSS test. So for the nonstationarity of our time series I hope to do not reject the null hypothesis at the DF test, the ADF test respectively, and vice versa to reject the null hypothesis at the KPSS test. The results are shown in the Table 21.

Table 21: Results of the DF, the ADF and the KPSS tests

	l_securitization	Result	l_reinsurance	result
DF test	p value = 0.6786	H_0 could not be rejected	p value = 0.7397	H_0 could not be rejected
ADF test	p value = 0.8075	H_0 could not be rejected	p value = 0.3625	H_0 could not be rejected
KPSS test	t statistic = 0.5557	H_0 is rejected	t statistic = 1.2100	H_0 is rejected

Source: Author based on Gretl

For the KPSS test are not used general p-values but are computed by software Gretl the special ones, which are shown in the Table 22.

Table 22: Critical Values of the KPSS test

	10%	5%	1%
Critical values	0.355	0.478	0.708

Source: Author based on Gretl

How is seen in the Table 21 p-values for the DF test and the ADF test are high enough so I could not reject the null hypothesis in any of these two tests. On the other hand, for the KPSS test I reject the null hypothesis at the 5 % significance level for both time series. Therefore I could say that both time series – the securitization and the reinsurance index – are nonstationary and I could examine a presence of cointegration.

One of methods for cointegration testing is called Engle – Granger method. Its authors based their method on the fact that if I construct the model from times series which are cointegrated then the residuals are stationary.

Using the OLS I estimate cointegration regression of the form:

$$y_t = \beta_0 + \beta_1 x_t + \epsilon_t$$

One of the disadvantages of this method is that I must select which index is the dependent variable and which one is the explanatory variable. Because of that I do also the second model, where both indices change their roles.

From the regressions´ results I am interested in estimated residuals and their stationarity, therefore I use the Dickey – Fuller test and I tasted equation:

$$\Delta\epsilon_t = \phi\epsilon_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta\epsilon_{t-i} + \varepsilon_t$$

The subject of our interest is the parameter ϕ. If I could not reject the null hypothesis about a presence of the unit root, I must conclude that there is no cointegration relationship. However, if I reject the null hypothesis, the alternative is the right one, that manifests the presence of cointegration, the time series are cointegrated. In the case of cointegrated time series I continue with next step - error correction – estimation of error correction model, where estimated residuals from cointegrating regression are used as one of the explanatory variables. From this final model is possible to describe long term relationship between time series, short term relationship between their changes and the speed at which these two markets return to equilibrium after some shocks or displacement. The results are shown in Table 23, the results in detail are in Appendix IV.

Table 23: Results of the ADF test for Estimated Residuals

	ADF test of estimated residuals	Asymptotic p-value of estimated residuals	Result
l_securitization	test statistic = -1.273	p_a – value = 0.839	H_0 could not be rejected
l_reinsurance	test statistic = -1.268	p_a – value = 0.6292	H_0 could not be rejected

Source: Author based on Gretl

Because I do not work with original values of the model but with estimated residuals, I could not use classical critical values of the Dickey – Fuller test but Engle and Granger constructed a new set of critical values. They are more negative than for

the classical DF test and also depend on the number of observations. Asymptotic p-values are only supportive indicator in this case. The critical values for two variables are shown in the Table 24.

Table 24: Modified Critical Values for Two Variables

time	1 %	5 %	10 %
50	-4.123	-3.461	-3.130
100	-4.008	-3.398	-3.087
200	-3.954	-3.368	-3.067
500	-3.921	-3.350	-3.054

Source: Author based on Enders (2010)

If I compare test statistics and critic values from the Table 24, I find out that I could not reject the null hypothesis at the 10 % significance level (neither 5 % neither 1 %). The critical values are reported for minimum T = 50 and I have T = 28, but due to the fact that with decreasing T value, decrease also critical value and our test statistics are around -1.2 I could state the conclusion.

Based on the results and discussion above I could not reject the null hypothesis at the 10 % significance level (neither 5 % neither 1 %) in both models so I could not demonstrate the presence of cointegration between securitization and reinsurance markets and therefore based on the definition above I have to admit the arbitrage possibility and thereby I could not confirm our hypothesis.

But for many reasons the EG method is relatively weak, therefore I analyze my hypothesis also by using the Johansen test for the presence of cointegration and the Vector Error Correction Model – VECM. The Johansen test is used more often than EG method. Its advantage is primarily that it can detect more cointegration relationships.

Firstly I need to find out if the times series are nonstationary – to do unit root tests. Because I work with the same time series as in the previous method, also the results about nonstationarity will be the same, so I used them and I could say that

base on the ADF test and the KPSS test both of our indices are nonstationary. The results are repeated in the Table 25.

Table 25: Results of the DF, the ADF and the KPSS tests[26]

	l_securitization	Result	l_reinsurance	Result
DF test	p value = 0.6786	H_0 could not be rejected	p value = 0.7397	H_0 could not be rejected
ADF test	p value = 0.8075	H_0 could not be rejected	p value = 0.3625	H_0 could not be rejected
KPSS test	t statistic = 0.5557	H_0 is rejected	t statistic = 1.2100	H_0 is rejected

Source: Author based on Gretl

In this moment I could continue with next step – the Johansen test – which gives the information about presence or non presence of cointegration between our two examined markets.

In the Johansen I work with this equation:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \varepsilon_t$$

where y_t is a vector of n variables and p is number of lags of this variables . This equation must be converted to VECM model, so I have the equation shown below:

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \cdots + \Gamma_{p-1} \Delta y_{t-(p-1)} + \varepsilon_t$$

where subject of our interest in the matrix $\prod$, which is in comparison with EG method like parameter ϕ, but with the difference that the parameter ϕ is a number whereas the matrix $\prod$ is the parameter of system of equations and allows us to observe more cointegration relationships.

[26] For detail interpretation of results and used critical values please note previous part

I focus on rank of matrix ∏, which corresponds to the number of cointegration relationships. In cases where zero of full rank of the matrix – h (∏) = 0 or h (∏) = n I have to state no cointegration. In cases where 0 < h (∏) = m < n, I have to state linearly independent cointegration vectors.

As mentioned above, the Johansen test is used more often than the EG method and the biggest advantage is possibility of multi – cointegration. There are two kinds of the Johansen test – "trace test" and "test with eigenvaluein" - in the first I use as the null hypothesis that r ≤ 0, r ≤ 1, … (r is number of cointegration relationships) against the alternative hypothesis r > 0, in the second one the null hypothesis, that r = 0, r = 1, … against the alternative hypothesis r = r + 1. For both tests, if the test statistic is greater than the critical value I reject the null hypothesis. The test statistics have the form:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1})$$

If I not reject the first null hypothesis, the test ends because it draws conclusion about no cointegration. In case of rejection the null hypothesis I continue to the point, where the null hypothesis will not be rejected. Testing is performed gradually for r = 0, 1, 2, 3, …, n.

After application the procedure above, the results are following:

a) From the precious procedure I founded the best lags as p = 2, based on values of Akaike Information Criterion (AIC)[27]

b) According to λ_{trace} and λ_{max} I consider one cointegration relationship as maximum, how is shown in the Table 26.

Table 26: The Presence of Cointegration

Rank	Test statistic - λ_{trace}	P - value	Test statistic - λ_{max}	P – value	Result
0	7.0974	0.3171	6.7878	0.2751	H_0 is rejected
1	0.30964	0.6501	0.30964	0.6413	H_0 could not be rejected

Source: Author based on Gretl

In both cases, there is the presence of one cointegration relationship, respectively by "trace test" there is maximum of one cointegration relationship, by the "test with eigenvaluein", there is just one cointegration relationship.

In a case of the presence of cointegration, the existence of long term equilibrium, I am interested in behavior of our examined indices and its stability. The matrix $\prod$ consists of two parts ($\prod = \alpha * \beta'$), where α is called "speed of adjustment vector" or "adjustment vector" and gives us the speed how fast the markets return to equilibrium state, which is the factor of our interest. The matrix β' gives us cointegration vectors.

At this moment I am interested in the second mentioned vector – cointegration vector – β. Its form is shown below:

[27] The best log was chosen p = 2, then we work with model without constant , because in models with costant - restricted, or unrestricted – due to Johansen test – we get no presence of cointegration relationship. Therefore I decided work with model without constant.

Table 27: The Cointegration Vector

l_securitizat	2.4577	0.82176
l_reinsurance	-4.1270	-1.4528

Source: Author based on Gretl

Very often is given in normalized form shown in the Table 28:

Table 28: The Cointegration Vector – Normalized Form

l_securitizat	1.0000	-0.56545
l_reinsurance	-1.6802	1.0000

Source: Author based on Gretl

Classically interpreted, when securitization markets increase by 1 % it means 1.6802 % decreasing of reinsurance market.

More important is the information from the VECM model. "*The VECM model allows the long run behavior of the endogenous variables to converge to their long run equilibrium relationship while allowing range of short run dynamics"* as mentioned in Mukhtar, 2010. The short-term dynamics fistly gives the sign (+/-), the information about significance the system, in case of significance secondly gives the information about the speed of convergence to equilibrium. These all information are given by error-correction term.

For a significant sign is considered the negative one, it confirms the stability of the system. Moreover I assume its absolute value between 0 and 1. The higher absolute value means the faster speed to reach the equilibrium, the more value close to 0, the markets reach their equilibrium more slowly and I could conclude great loss of system stability. Positive sign means automatically that the divergence from equilibrium takes place and the system is unstable (Mukhtar, 2010).

Remind at this point the form of VECM model:

$$\Delta y_t = \alpha(\beta' y_{t-1}) + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \cdots + \Gamma_{p-1} \Delta y_{t-(p-1)} + \varepsilon_t$$

where α is the vector of error correction term. Summary of results of the VECM model is shown in the Table 29.

Table 29: Summary of Results of the VECM model

	d _l_securitization	**d _l_reinsurance**
Error-correction term	**-0.249000 (0.0458)**	**-0.0418300 (0.0884)**
R-squared	0.162340	0.120974
Adjusted R-squared	0.089500	0.044537
S.E. of Regression	0.230535	0.043938

Source: Author based on Gretl

Note: p-values are in parentheses

Based on results shown in the Table 29 I could conclude that both of error correction terms are negative, so they have a tendency to confirm the stability of the whole system but on the other hand and it is the most important part, how short – run dynamics fluctuation influence the stable long run equilibrium – the absolute values are dramatically low, close to 0. Therefore the markets returns to equilibrium are very slowly and reluctantly. This fact corresponds to what is written above in discussion, the boundary of presence and absence of cointegration is very thin.

To be more concrete, in a case where the dependent variable is the securitization index the ECT = -0.249000, so only 25% of the disequilibrium is corrected in three months.[28] In a case where the dependent variable is reinsurance index this percentage declines to 4% - dismal value.

[28] We work with quarterly data

3.4.3.1. Conclusion

Between the examined markets I conclude one cointegration relationship. That does not correspond to the EG method, but as mentioned above, the EG method contains several weaknesses so the Johansen and the VECM model has higher significance level. And I could conclude that the result of the VECM model fully corresponds to our hypothesis and our discussion. Between securitization and reinsurance market exists cointegration relationship, therefore there is no presence of arbitrage, but adjust the focus on results of the VECM model, short –run dynamics and "adjustment vector", the values of error-correction terms are really close to 0, the markets returns very slowly and reluctantly. The whole system is unstable, so it corresponds to what is written above, that the boundary of presence and absence of cointegration is very thin.

3.5. Summary of results

In this subchapter I will proceed as in the previous one – gradually according to the hypotheses – I point out the final results and interesting behavior of selected variables. The whole subchapter ends with an overview of hypotheses and their comparison. In cases where it is necessary there are given the main points of discussion.

3.5.1. The Hypothesis 1

I set up my first hypothesis based on development of two main variables: Issuance of securitization and development of CDS spread market in Italy. Because of many ups

and downs I focus on their behavior and general trend after 2008 and I say that CDS spreads are negatively correlated with the volume of securitization. During the whole process I used logarithm of selected variables and the panel dataset of Top 8 Italian banks in quarterly frequency is processed by Gretl software.

Due to the facts that I work with non random selected banks and the short panel I assume the panel data with fixed effects will be used. But after the F test - where I could not reject the null hypothesis - I realize better way is to use the pooled OLS model. This fact is confirmed by the Breusch-Pagan test. In both cases – the panel data with fixed effects and the pooled OLS model – I had to solve problems with autocorrelation and heteroscedasticity, therefore the final model is extended by lags of dependent variable, respectively the robust standard errors for case of heteroscedasticity. Finally for all models I passed through the test of normality of residuals, the results are available in Appendix II.

Because the pooled OLS model does not keep the panel data structure that is undesirable for me, I used Hausman test to decide between two models – the panel data with fixed effects or random effects. Because the null hypothesis of Hausman test could not be rejected, the panel data with random effect are required. Because the large number of explanatory variables reduces degrees of freedom of the regression and they are insufficient in this case I solve this problem by using Stepwise method – forward selection, see Appendix III. After trying several tens of models I chose the best one.

Furthermore, bear in mind that this procedure was linked with two datasets. As the model 1a was classified model that includes all 8 banks in period of time 2008 – 2012 and the model 1b was classified model that includes only 7 banks – except UBI bank – but in whole period of time 2006 – 2012. Summary of the results of the best models – pooled OLS model with robust standard errors and the panel data with random effects - is available in the Table 30.

Table 30: Summary of Results – the Hypothesis 1

	Model 1a/1b	Coefficient of l_CDS_spreads	Std. Error	t-ratio	p-value	Significance
Pooled OLS model	Model 1a	**2.07917**	0.1617	12.86	<0.00001	***
	Model 1b	0.0569285	0.0394	1.44	0.15048	
Panel data with random effects	Model 1a	**1.13639**	0.5016	2.27	0.50840	**
	Model 1b	-0.0181135	0.05	-0.36	0.71771	

Source: Author based on Gretl

As evident, higher significance of CDS spreads is observed in the model 1a, where are included all banks in period o f time 2008 – 2012 that corresponds to the fact that growing trend of CDS spreads started in 2008. Based on the results I have to reject my hypothesis 1 and I have to conclude that CDS spreads are positively correlated with the volume of securitization. Coefficient β is in both cases of the model 1a greater than 1, therefore the securitization market grows faster than CDS spreads. Moreover in all models I register non-significance of two explanatory variables – Inflation and Domestic_BS.

3.5.2. The Hypothesis 2

In the hypothesis 2 - CDS spreads are negatively correlated with the volume of reinsurance – I chose exactly the same procedure as for the hypothesis 1. I started with the panel data with fixed effects but after result of the F test I realize using the pooled OLS model is desirable. This fact was confirmed by the Breusch – Pagan test. Also here I faced problems with autocorrelation and heteroscedasticity, therefore I included lags of dependent variables and use robust standard errors. The results of all tests including the tests of normality of residuals are available in Appendix II.

To keep the panel data structure I passed the Hausman test and based on its result I find out that better model is the panel data with random effects. Because of problems with degrees of freedom I pass again the Stepwise method – forward selection, see Appendix III.

In contrast to the hypothesis 1 I work only with one dataset because of all data availability for all 8 insurance companies for whole period of time 2006 – 2012. The least significant explanatory variables were evaluated ROE, log_TA and Stoxx_600_Insur. The results of the best models – the pooled OLS model with robust standard errors and the panel data with random effects - are available in the Table 31.

Table 31: Summary of Results – the Hypothesis 2

	Coefficient of l_CDS_spreads_b	**Std. Error**	**t-ratio**	**p-value**	**Significance**
Pooled OLS model	-0.114435	0.383646	-0.2983	0.76582	
Panel data with Random effects	**0.945901**	0.248001	3.8141	0.00018	***

Source: Author based on Gretl

In contrast to the hypothesis 1, here are the conclusions dramatically different so I have to ignore one of them. It is logical that I decided to ignore the pooled OLS model because my aim is to keep the panel data structure and examined explanatory variable is in the panel model with random effects highly significant. Therefore I reject the hypothesis 2 and I have to conclude that CDS spreads are positively correlated with the volume of reinsurance. The coefficient β is lower than 1 so I could say that reinsurance market grows more slowly than CDS spreads. Due to the fact that the coefficient β is lower but very close to 1 it could mean that reinsurance market show the small involvement in the development of bank CDS spreads.

3.5.3. The Hypothesis 3

In the last hypothesis I was interested in arbitrage condition between Italian securitization and reinsurance markets. Because of still more stringent regulatory conditions I assume no arbitrage opportunity. I decided to examine this relationship by cointegration analysis, because no cointegration relationship means arbitrage opportunity. The dataset were converted to two indices – securitization index and reinsurance index.

Firstly I pass both indices through the Dickey – Fuller test and the KPSS test because non-stationary of both indices is required. Because of no sufficient power in cases where characteristic unit root of time series is in absolute value close to one, I used Augmented Dickey – Fuller test. I could not reject the null hypothesis of the Dickey – Fuller test, the Augmented Dickey – Fuller test respectively, and I reject the KPSS test´s null hypothesis so I could state non-stationarity of both indices and continue to analyze a presence of cointegration. For that I used two methods the Engle – Granger method and the Johansen test.

Based on the Engle – Granger method I have to conclude that the time series are not cointegrated, so arbitrage opportunity is significance that corresponds to the original hypothesis. In contrast the Johansen test indicates the presence just one cointegration relationship and the possibility of arbitrage rejects. Because the EG method is relatively weak with many disadvantages against the Johansen test I consider relevant the result of the Johansen test and therefore I could not reject the original hypothesis and I conclude that the arbitrage between securitization and reinsurance market is not significant. Their long term I describe classically - when securitization market increase by 1 %, the reinsurance market decrease by 1.6802 %. The normalized form of their cointegration vector is repeated in the Table 32.

Table 32: The Cointegration Vector – Normalized Form

l_securitizat	1.0000	-0.56545
l_reinsurance	-1.6802	1.0000

Source: Author based on Gretl

Finally I pass through the VECM model that gives me the information about short – term dynamic behavior. Results - repeated in the Table 33 - show the fact that securitization and reinsurance markets reach their long term equilibrium very slowly, the whole system is highly unstable and only 25 % of disequilibrium (4 % respectively) are corrected in three months. It corresponds to the fact that the boundary between presence and absence of cointegration is very thin.

Table 33: Summary of Results of the VECM Model

	d _l_securitization	**d _l_reinsurance**
Error-correction term	**-0.249000** **(0.0458)**	**-0.0418300** **(0.0884)**
R-squared	0.162340	0.120974
Adjusted R-squared	0.089500	0.044537
S.E. of Regression	0.230535	0.043938

Source: Author based on Gretl

Note: p-values are in parentheses

3.5.4. Summary of Hypotheses

In the final Table 34 I present the summary of hypotheses. As is evident, in the both cases where I examine behavior of CDS spreads I reached the opposite conclusion than was my hypotheses so I rejected both of them. Non significance of regulatory arbitrage on the contrary could not be rejected. Despite this fact I have to remind the discussion that about the instability of the whole system mentioned above.

Table 34: Summary of Hypotheses

Hypothesis	Result
CDS spreads are negative correlated with volume of securitization	Rejected
CDS spreads are negative correlated with volume of reinsurance	Rejected
Regulatory arbitrage between reinsurance and securitization market is not significant	Could not be rejected

Source: Author

3.6. Further Research Opportunities

My analysis focus on not so much explore economic research area, I examine relationship of two markets which are obviously examined separately. This fact brings answers on the important, actual and new questions but also brings a lot of wide spectrum of opportunities that give more precise and more detail answers and follow up whole study.

Firstly, in my research I focus on the Italian securitization and reinsurance markets, therefore it is interesting examine the behavior of these markets for other EU member countries and compare the results, moreover extend the study and the comparison between EU member countries and EU non-member countries.

Secondly, interesting benefit guarantees using of other financial tools than credit default swaps like collateralized debt obligations or assets backed securities. For my research I chose CDS because of their high liquidity but it would be shortsighted to globalize their results for whole group of structured finance. Their mutual comparison can bring new perspective and insights which tools are for example riskier.

Finally, huge area of different approaches to this topic is hidden in the methodology and dataset. I decided for the panel data analysis and the cointegration analysis but there exist a lot of opportunities. This closely associated with a question of dataset. I worked with quarterly frequency of dataset, but obviously, closer and long-term cooperation with selected institutions provide better quality of dataset with higher frequency and thus more opportunities how explore them.

4 Conclusion

In my thesis I examined regulatory arbitrage between Solvency II and Basel III in alternative transfer risk on the Italian market. At first, I studied behavior of a proxy of financial instrument - Credit Default Swap - which played big role during the financial crisis, on the securitization market and the reinsurance market. I found out that its price represented by CDS spreads is important and significant explanatory variable. CDS spreads are positively correlated with the volume of securitization. This fact corresponds to the different behavior of Italian and European securitization market. But in this case their relationship is strongly dependent on surrounding macroeconomic conditions or the phase of economic cycle.

In the reinsurance market the behavior of CDS spreads is same as on the securitization market. I have to say that the development of CDS spreads is very important for the development of the volume of reinsurance, moreover I have to mention it may seem that Italian insurance companies do not feel the threat coming from the CDS market but this peace is not unfounded and insurance market should be more guarded against financial instruments used to risk transfer. This fact was also confirmed by the third hypothesis.

Finally I was interested in the main question, if there is a cointegration relationship, long-term balance, between the securitization market and the reinsurance markets. I have to conclude that between these two markets only one cointegration relationship occurs, therefore there is no presence of arbitrage, but the speed with which the markets return to equilibrium is not so high and stable, so the boundary of presence and absence of cointegration is very thin. It could indicate area for many other possibilities of the procedures in structured finance. Moreover, my work confirmed that the regulation and control of the relationship not only between

these two markets but among all markets corresponding to the structured finance is more than appropriate.

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Appendix I: Signs of Variables

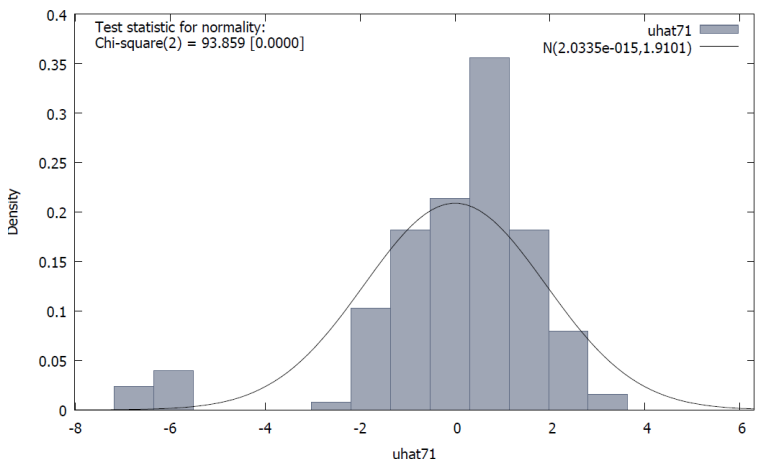
Sign	Title	Sign	Title
l_secu	Logarithm of securitization	GDP_growth	GDP growth
l_rein	Logarithm of reinsurance	Inflation	Inflation
l_CDS_spread	Logarithm of CDS spreads	Stoxx_600_bank	Stoxx 600 insurance index
l_CDS_spread_1	Logarithm of CDS spreads in time t-1	Stoxx_600_Insur	Stoxx 600 bank index
log_TA	Logarithm of Total Assets	ICA_to_GDP	Insurance company assets to GDP
E_to_TA	Equity to Total Assets	CBA_to_GDP	Central bank assets to GDP
C_to_I	Cost to Income ratio	LIP_to_GDP	Life insurance premium volume to GDP
ROA	Return on Average Assets	NLIP_to_GDP	Nonlife insurance premium volume to GDP
ROE	Return on Average Equity	EL_to_GDP	External loan and deposits of reporting banks vis a vis all sector to GDP
NL_to_TA	Net Loan to Total Assets	Domestic _BS	Domestic provided banking sector to GDP

Appendix II: Tests

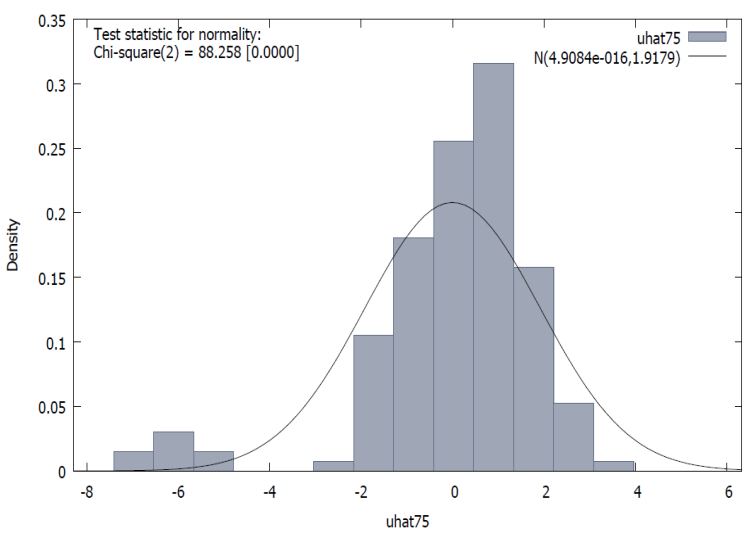
Hypothesis 1

Model 1a

Panel data with fixed effects in model 1a – test of normality



Pooled OLS model – model 1a – test of normality



Model 1a – F test and Breuch-Pagan test

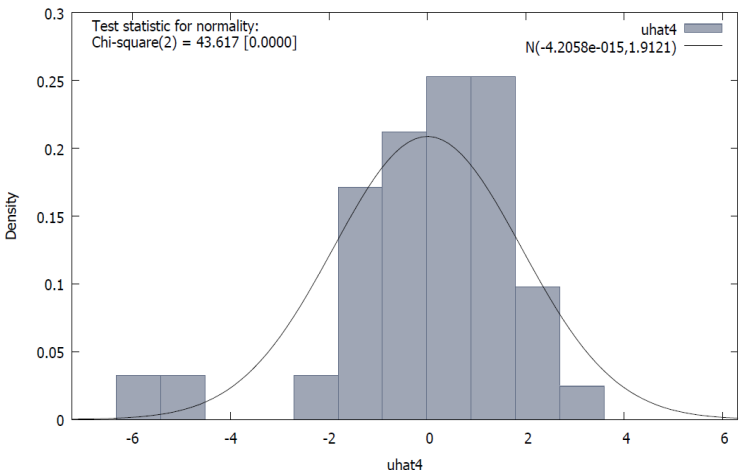
F(7, 134) = 0.155501 with p-value 0.992968

Breusch-Pagan test statistic:

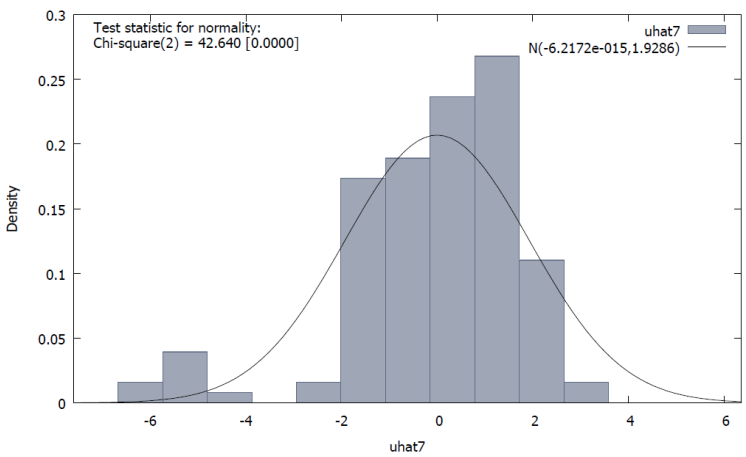
LM = 3.15141 with p-value = prob(chi-square(1) > 3.15141) = 0.0758616

Robust estimation

Panel data with fixed effects in model 1a – test of normality



Pooled OLS model – model 1a – test of normality



Model 1a – F test and Breuch-Pagan test

F(7, 114) = 0.282523 with p-value 0.959654

Breusch-Pagan test statistic:

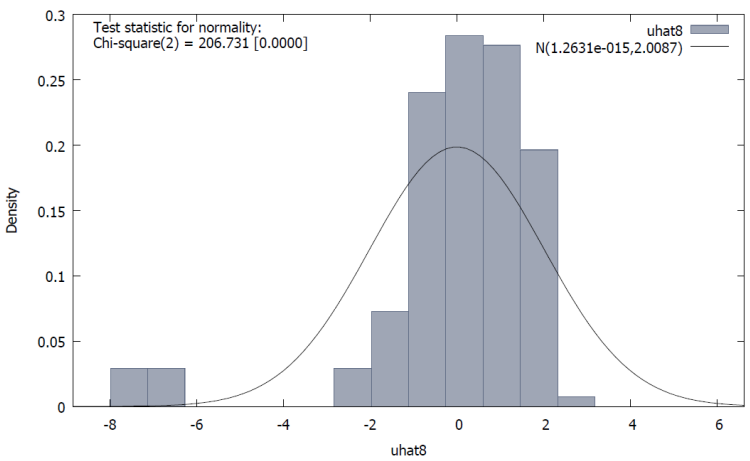
LM = 2.3535 with p-value = prob(chi-square(1) > 2.3535) = 0.125002

Random effect

Model 1a - Hausman test

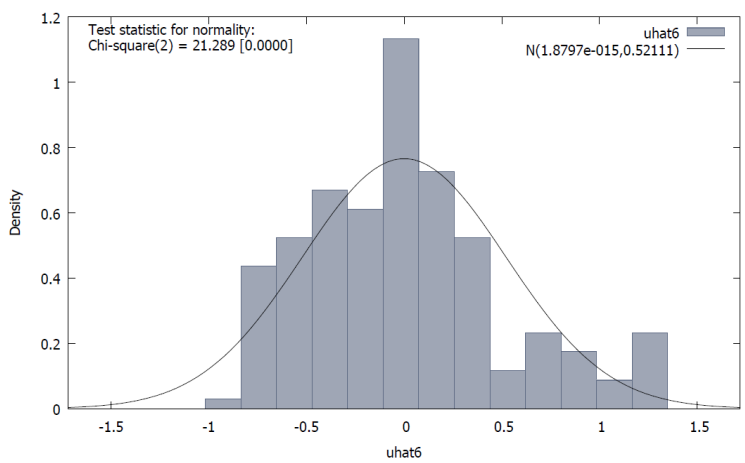
Chi-square(6) = 1.20778 with p-value = 0.976499

Panel data with random effects in model 1a – test of normality



Model 1b

Pooled OLS model - model 1b – test of normality



Model 1b – F test and Breusch- Pagan test

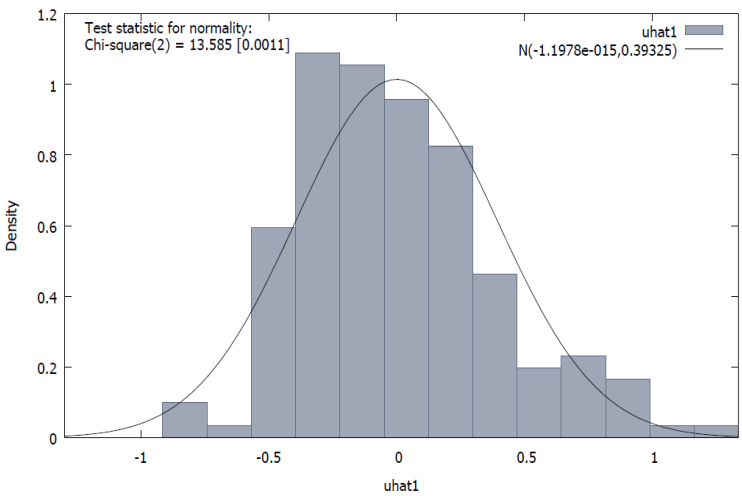
F(6, 171) = 0.402604 with p-value 0.876586

Breusch-Pagan test statistic:

LM = 1.64002 with p-value = prob(chi-square(1) > 1.64002) = 0.200323

Robust estimation

Pooled OLS model - model 1b – test of normality



Model 1b – F test and Breusch- Pagan test

F(6, 156) = 0.497131 with p-value 0.809814

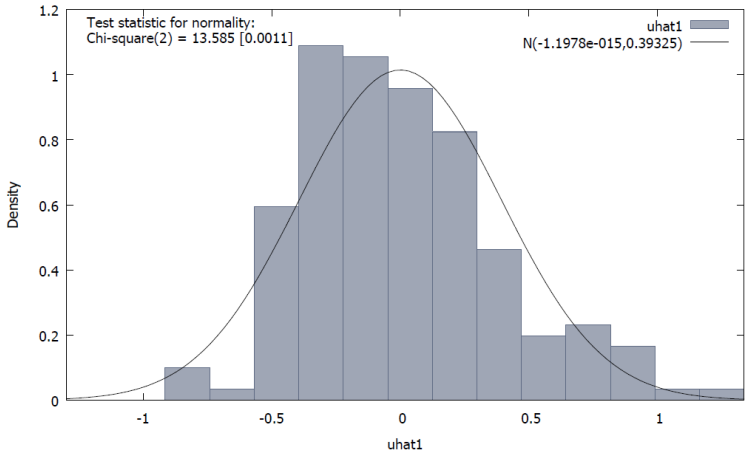
Breusch-Pagan test statistic:

LM = 1.4151 with p-value = prob(chi-square(1) > 1.4151) = 0.234211

Model 1b - Hausman test

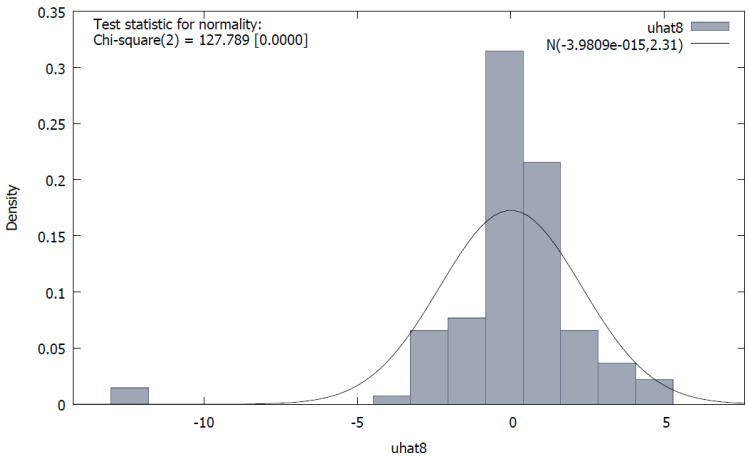
Chi-square(5) = 0.203834 with p-value = 0.999072

Panel data with random effects in model 1b – test of normality

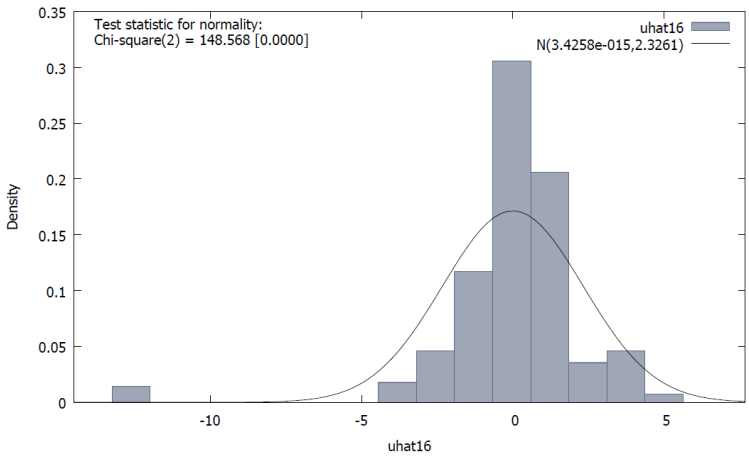


Hypothesis 2

Panel data with fixed effects – model 2 – test of normality



Pooled OLS model – model 2 – test of normality



Model 2 – F test, and Breusch- Pagan test

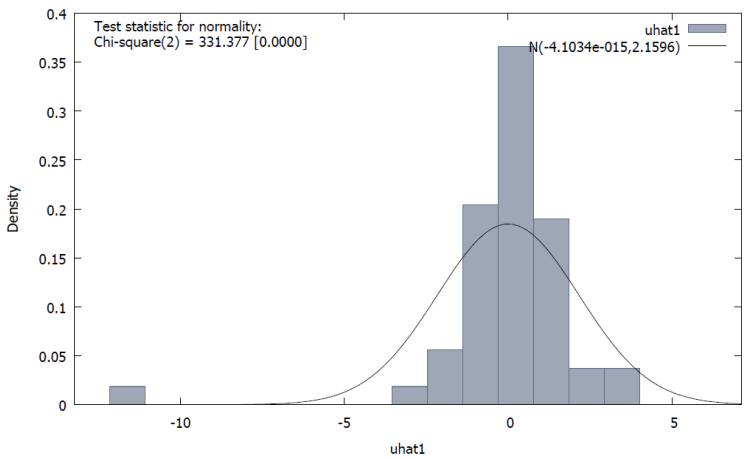
F(7, 209) = 0.416989 with p-value 0.891109

Breusch-Pagan test statistic:

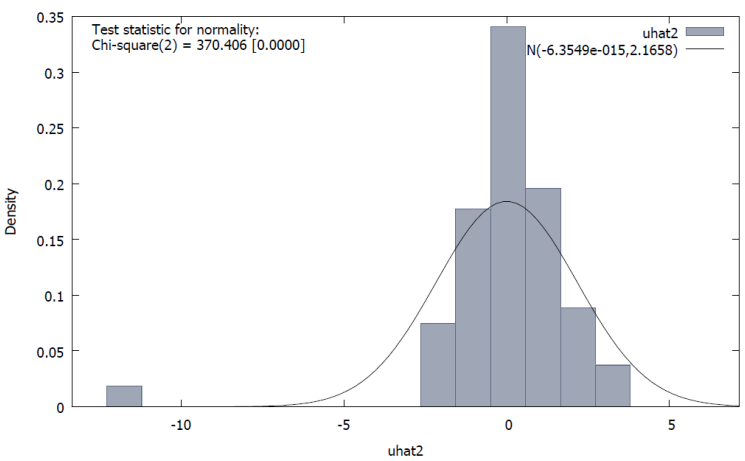
LM = 1.62834 with p-value = prob(chi-square(1) > 1.62834) = 0.201932

Robust estimation

Panel data with fixed effects – model 2 – test of normality



Pooled OLS model – model 2 – test of normality



Model 2 – F test, and Breusch- Pagan test

F(7, 179) = 0.146492 with p-value 0.994214

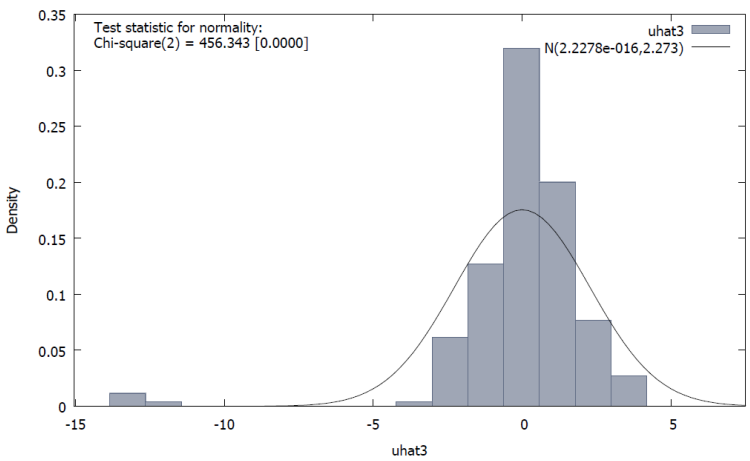
Breusch-Pagan test statistic:

LM = 3.11542 with p-value = prob(chi-square(1) > 3.11542) = 0.0775546

Model 2 – Hausman test

Chi-square(6) = 2.21919 with p-value = 0.898476

Panel data with random effects – model 2 – test of normality



Appendix III: Stepwise Method

STEPWISE METHOD – SEE THE ATTACHED TABLE

Appendix IV: The EG Method

Stationarity of estimated residuals:

Residuals from model with l_securitization as a dependent variable

Augmented Dickey-Fuller test for uhat

model: (1-L)y = (a-1)*y(-1) + ... + e

1st-order autocorrelation coeff. for e: 0.003

lagged differences: F(4, 18) = 0.148 [0.9616]

estimated value of (a - 1): -0.220327

test statistic: tau_c(2) = -1.27296

asymptotic p-value 0.839

Residuals from model with l_reinsurance as a dependent variable

Augmented Dickey – Fuller test

model: (1-L)y = b0 + (a-1)*y(-1) + e

1st-order autocorrelation coeff. for e: 0.008

estimated value of (a - 1): -0.0914655

test statistic: tau_c(1) = -1.26818

p-value 0.6292

Appendix V: The VECM model

beta (cointegrating vectors, standard errors in parentheses)

l_securitizat	1.0000
	(0.00000)
l_reinsurance	-1.6802
	(0.0098197)

The VECM model

Equation 1: d_l_securitizat

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
d_l_securitiz_1	0.112198	0.203504	0.5513	0.58672	
d_l_reinsuran_1	-0.971795	1.10943	-0.8759	0.39012	
EC1	-0.249	0.117939	-2.1113	0.04583	**

Mean dependent var	-0.014077		S.D. dependent var	0.230535
Sum squared resid	1.117285		S.E. of regression	0.220403
R-squared	0.162340		Adjusted R-squared	0.089500
rho	-0.049092		Durbin-Watson	2.090242

Equation 2: d_l_reinsurance

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
d_l_securitiz_1	0.0188484	0.0405693	0.4646	0.64659	
d_l_reinsuran_1	-0.163254	0.221169	-0.7381	0.46789	
EC1	-0.04183	0.0235114	-1.7791	0.08844	*

Mean dependent var	-0.007439		S.D. dependent var	0.044306
Sum squared resid	0.044403		S.E. of regression	0.043938
R-squared	0.120974		Adjusted R-squared	0.044537
Rho	-0.034817		Durbin-Watson	2.064082