LUISS GUIDO CARLI UNIVERSITY

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# *The ABS market: securitization and regulatory responses after the financial crisis*

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# INTRODUCTION

During the last twenty years, the worldwide markets have witnessed an overwhelming process of financial innovation, which has completely revolutionized the traditional model of intermediation. In this context, a quick and massive development of a new class of structured products has occurred: the Asset-Backed Securities (ABS).

At the center of the securitization process, the ABSs are characterized by powerful peculiarities, which make them very useful tools for the financial institutions. In fact, the cash flows of these instruments are based on the performance of an asset pool that comprehends mostly loans, leases and other receivables. Therefore, they allow the transformation of the illiquid assets, held by financial firms in their accounting books, into tradable securities on the secondary markets.

Before the beginning of the financial crisis, the growth of this market segment has been exponential. The advantages connected to the securitization process are many, such as the generation of new liquidity from potentially illiquid assets; the redistribution of the credit risks; the construction of retailed instruments for the specific needs of the investors; the creation of instruments with attractive risk-return profile.

Driven by the several benefits, many financial firms have exploited the securitization process to create ABSs with increasingly lower creditworthiness that were often mispriced and rated as high quality instruments, usually backed by US subprime mortgages.

When the house bubble burst triggering the price collapse of the residential properties and the consequent failure of many borrowers, the weaknesses of the system have revealed, and many now worthless ABSs, which had spread in all the financial system have been the major reason behind the failure of many institutions.

It is for this reason that these instruments have been stigmatized by the actors on the global markets, who blamed them as the unique cause of the financial crisis. Even if the ABSs have been deeply involved in the Great Recession and they have greatly amplified the diffusion of the economic instability overseas too, it is important to understand that they are not harmful instruments by construction and, if used in the proper way they can lead to great improvements for all the stakeholders of the financial markets.

Starting from this point, this thesis has the aim to enlighten the potential benefits of the ABSs and show that the extreme caution that has pervaded the markets after the recent crisis towards these securities has brought to the design of an excessively penalizing regulatory environment, which does not allow the correct development of these financial products.

To validate this intuition, a quantitative analysis on the US and EU ABS markets is carried out in order to confirm and assess the deleterious effects of the regulatory interventions implemented in response to the financial crisis, especially if compared to other similar classes of assets. The thesis is organized as follows.

The first chapter begins with an overview of the financial markets progress; then, it moves toward the description of the main features that characterize the ABSs and the complex structure of the securitization process, which are analyzed from both an analytical and historical perspectives, screening their role in the financial crisis and their slow recovery process thereafter. Finally, a brief literature overview on the functioning of the ABS market is provided.

The second chapter's purpose is to illustrate all the positive aspects related to the ABS securities and offer a detailed explanation of the regulatory measures taken in response to the crisis of 2007 in EU and US. For both of these markets, the description first focuses on the unconventional monetary policies implemented by the regulators and then explicates the regulatory reforms in place, focusing on the completion of the Dodd-Frank Act for the US and the Basel III reforms, still ongoing for both EU and US.

Lastly, the third chapter outlines different methods to measure the regulatory impacts on the economy with the help of a literature overview of the major studies in this very challenging field. Then it supplies the detailed analysis of the simple but straightforward model used in this work to measure the impact of the Dodd-Frank Act and Basel III reforms, discussing the principal conclusions of the study that lays its foundation in an IMF report of 2012.

# CHAPTER 1
# INTRODUCTION TO THE ASSET BACKED SECURITIES MARKET

## 1.0 Purpose of the chapter

The Asset-Backed Securities are one of the major financial innovation experienced in the last decades, which have completely upset the intermediation chain between borrowers and lenders.

Involved in the financial crisis, these products have found themselves in the eye of the storm, and they have just started a recovery process.

The aim of this chapter is to explain the fundamental changes the market has been subjected to, and then to describe the main features of the ABSs instruments with a quick overview of their brief historical breakthrough. The conclusive part focuses on a brief explanation of the main analyses conducted on the ABS market from 2007 until today.

## 1.1 The evolution of financial markets

From the 1970s on, the financial markets have been the object of a profound and continuous process of innovation, which has strongly increased the degree of flexibility of the whole economic system in general. To understand the reasons behind this process, it is enough to think about the progressive deregulation of the markets, the privatization processes and the increase of competition and globalization that are just some of the dynamics that have interested the economy worldwide. In this constantly changing context, the nature of financial intermediation processes have deeply changed too, in particular from the 1980s on.

In fact, there has been a passage from the traditional model of financial intermediation to a market-based system. In the first model, the lenders such as households and other financial institutions that make investments on behalf of households (i.e. pension funds, mutual funds, life insurance companies) transfer money through the banking channel to the borrowers (i.e. other households, non-financial firms, governments). In the second model, that progressively replaced the first one, the chain of the intermediation becomes much longer: the main financial innovation that has made possible this transformation is the process of securitization, which will be accurately illustrated in the next paragraph.

Using this new market-based system, the entire process of financial intermediation has changed: the chain through which the lenders transfer money to the borrowers becomes more stretched.

Generally speaking the lenders, instead of depositing their savings into a bank, as it happened in the old system, invest in the money market funds (MMFs), such as mutual funds, that are the principal buyers of the short term paper issued by the commercial banks to finance themselves. The same commercial banks enter into repurchase agreements[1] (repos) with investment banks and other financial firms, that issue the aforementioned repos in order to fund the purchase of ABSs held in their portfolios. However, these financial securities are no more than mortgages pooled together and tranched by the ABS issuer to create Mortgage Backed Securities (MBSs), which were originally granted to households by banks and then sold to a mortgage warehouse, a passive firm constituted with the sole purpose of holding the mortgages.

This is just one exemplification that shows how many layers can now be constructed between the original lenders and borrowers with respect to the bank-based model. In this kind of system, there is a deep interconnection between banking and capital markets changes. Therefore, the variation of any financial condition has a strong impact on the real economy.

In this context, the role of the broker-dealers system in the securities markets becomes much more central. This is clearly mirrored in:

- The rapid increase in the size of the financial securities sector during all the period before the crisis;
- The very short-term nature of the financial intermediaries' obligations in their balance sheets that exposes them to the volatility of the market conditions.

In fact, the fluctuations of the asset prices are instantaneously reflected in the balance sheets, using the mark-to-market[2] accounting technique: this translates into a reduction of the balance sheet size during the periods of an assets price decline, and into an increase of the size in the periods of assets price growth.

[1] A repurchase agreement is "the process of borrowing money by combining the sale of an asset (usually a fixed income security) with the subsequent repurchase of that same asset for a slightly higher price (which reflects the borrowing rate)".
Source: https://www.ecb.europa.eu/home/glossary/html/glossr.en.html#100

[2] The marking-to-market is the accounting practice of the systematic revaluation of securities and financial instruments recorded in the balance sheet using current market prices of those assets

For example, if there is an increase in the value of the assets held by a bank, there will be also an increase in the market value of equity. Consequently, the new capacity of the balance sheet will be used to enlarge the lending but also the funding: in one word, the bank will want to increase its leverage exposure. The major risk involved in this process could be the lowering of the lending standards to get more borrowers, exposing the institution to greater risks and fragility.

## 1.2 An insight about the securitization process

The meaning of the term "securitization"[3] defines a financial technique used to convert pools of assets, held by a bank in its balance sheet, into financial securities that are tradable on the secondary markets. The principal and interest of these securities depend on the cash flow that are generated by the underlying assets, as it happens with derivative instruments.[4]

In practice, the securitization process comes up with the issuance or creation of bonds backed by loans, assets, public works projects, and other illiquid sources of revenue with the goal of turning them into tradable securities.

### *1.2.1 The parties involved*

This process is not entirely managed by the bank (also known as originator or sponsor), but it involves several other parties. The most important one is the Special Purpose Vehicle (SPV or Conduit).

The SPV, that sometimes is simply named issuer, is a subsidiary entity of the bank, which is bankruptcy remote from the main organization and constituted with the sole purpose of buying the pooled assets of the bank. Note that the exposures bought by the SPV can directly come from the balance sheet of the financial institution, but they can also come from another non-financial entity, the original lender.

[3] Here the term refers to the "*true-sale*" securitization process, that differs from the "*synthetic* " securitization, described afterwards

[4] https://www.ecb.europa.eu/home/glossary/html/act1s.en.html#709

This operation is funded with the issuance of a particular kind of securities on the market: the Asset Backed Securities (ABSs) that will be discussed later in this section.

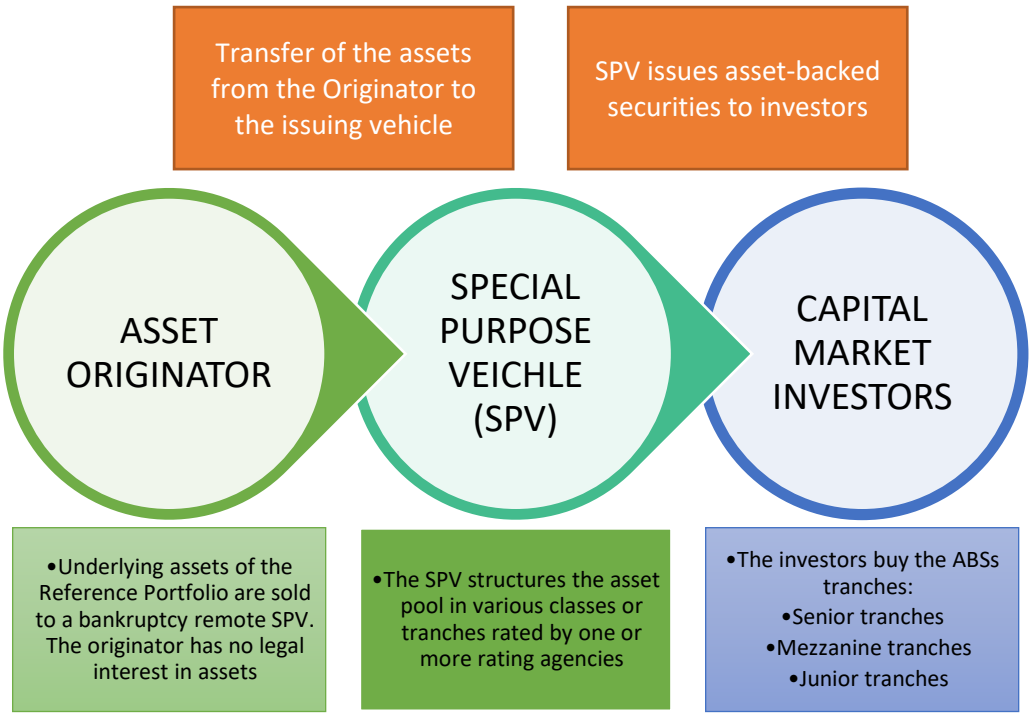


**Figure 1. The securitization process diagram**
**Source: Jobst, 2008**

The ABSs are usually sold to an investment bank, called underwriter, that in accordance with the credit rating agency (CRA)[5] delineates the structure of the transaction (e.g. the number of classes to be created, the different rates and so on) in order to better place them on the market. Generally, the arrangers assist the originator in this process: they are consultants that deal with a series of issues such as forming the banks syndicates to place the securities, advising on the optimal structure of the securitization in order to maximize the returns under the regulation and the CRAs constraints, also preparing the legal documentation.

The CRAs involved in the securitization process express an opinion about the creditworthiness of the different ABSs tranches estimating their riskiness. The fundamental difference between the normal rating process and the one involved in the securitization process relies on the fact that in the latter case the evaluation happens before

[5] The credit rating agencies are private independent institutions whose purpose is to assess the creditworthiness of bond issuers, such as firms or governments. The most important entities are: Standard and Poor's (S&P), Moody's and Fitch Ratings

the issuance of the securities, and not ex-post as in the case of bond ratings. Therefore, their structure can be specifically designed to obtain a precise rating, contributing to the distortion the judgment process. The ways in which better ratings can be attained are many and they broadly take the name of "*credit enhancement*"[6] techniques.

Finally, the other parties who get a relevant role in the practice of securitization are the servicer and the trustee. The servicer absolves to a number of administrative functions for the SPV in exchange of a fee, and in certain cases it can coincide with the originator: the main tasks are the collection of payments and the monitoring of the ongoing of the portfolio underlying assets, taking remedial actions if necessary (e.g. foreclosures on properties). The servicer transfers the payments to the trustee, which is in charge of using the money received to pay the investors verifying the accordance to the contract terms and the respect of the priority scale of repayments.

In this way, the process of making loans becomes completely detached from the process of holding loans in the portfolios. Indeed, the banks and the other financial institutions that for years have collected and lent funds mostly through the issuance of loans kept in their book accounts until maturity, even in the case of changes in the profitability of other alternative investments, are now able to trade them freely and become completely alien to the credit risk associated to them.

### *1.2.2 The credit enhancement techniques*

The credit enhancement system represents one of the main news introduced by the securitization, and therefore it deserves a particular deepening. It comprehends a variety of financial methods used to reduce the credit risk associated to the ABS tranches, improve the probability that the investors will actually get the promised stream of cash flows and consequently secure higher rating evaluations from the CRAs.

Broadly, it is possible to distinguish two macro categories of credit enhancement: the internal and external ones. Frequently the second type of measures, which is provided by a third entity, is used as an additional support to the first layer of internal techniques.

[6] The credit enhancement is "any methodology that reduces the credit risk of a transaction with a counterparty"
Source: BIS, 2015

First of all, as it will be seen more deeply later on, the most used technique is tranching (or subordination): the underlying pool of assets is divided into different subgroups that enclose assets with similar features such as interest rate, maturity, geographical location or expected delinquency rate[7]. Therefore, each tranche is associated to a different risk-return profile on the basis of its characteristics, that establish their priority in the repayment, called "*waterfall*"[8]. The innovating feature of the tranches consists in the fact that each of them is traded and sold as an independent instrument, endowed with its own rating, rights and maturity, so they are securities at all effects. In this way, it is possible to tailor the ABSs on the specific needs and risk preferences of every investor:

- The most risk-averse individuals will choose to buy senior tranches, that are typically very high rated bonds since they are the first to be paid off and the last ones to absorb the potential losses coming from the default of the revenue-generating assets of the pool. Very often part of these tranches is also retained by the originator itself;
- The most risk-lover investors (e.g. hedge funds), will prefer the so-called junior or equity tranches, that are characterized by a higher yield because they are the first one to bear losses and the last ones to be repaid with the cash generated from the underlying assets;
- The "intermediate" actors of the market will choose the mezzanine tranches, located between the two extreme positions. Generally, these are the most difficult instruments to be placed, and so, they are segmented again into other tranches (that follow the same tripartite scheme), leading to the so-called "*resecuritization process*"[9]. In this last scenario, the underlying assets of these tranches are the mezzanine tranches of the original ABS and no more the pool of assets.

[7] The delinquency rate is the ratio between the delinquencies and the total number of loans. A delinquent payment is a late or overdue payment. It is the state that precedes the default

[8] It is important to make a further distinction between the sequential waterfall and the pro-rata waterfall. The first one pays the principal and interests (in a separated or unique stream) of the most senior class until it is paid off and then proceeds in order of seniority with the others. The second one instead, allocates a portion of the cash received by the underlying to repay all the classes in proportion of their incidence on the total amount of tranches issued

[9] The resecuritization process is the packaging of a number of existing securitized debt obligations into a new tradable security. They can be either a collection of similar obligations or a mixed class of instruments

To sum up, it can be useful to imagine two broad categories in which the tranches can be grouped. The field of liquidity products, which provide higher quality and liquid tranches with lower credit risk level, and the area of credit products, which instead incorporate subordinated tranches with a lower credit quality, higher levels of credit risk exposure and idiosyncratic risk[10] but also higher yield opportunities for investors.

Secondly, other forms of credit enhancement aimed to the reduction of risk, such as overcollateralization and cash reserve, can be adopted.

The overcollateralization is realized issuing securities for a total value that is inferior to the value of collateral. The cash reserve, instead, is a reserve account destined to cover eventual losses and it can be arranged in several ways. The most common sources of cash used to feed this reserve are:

- The excess spread, which is the net interest payment calculated as a difference between the yield of the portfolio and all the payables and expenses (structure fees, servicing fees and weighted average of the yields of the notes);
- The yield spread, also known as excess servicing, which is the difference between the coupon paid on the underlying assets and the coupon paid to the investors of the ABSs;
- A reserve fund, which can be formed through the combination of the other spreads, but in general is a separate reserve of cash set up by the issuer to the extent of cover losses for that predefined amount.

In alternative, external third parties as banks and insurance companies can provide additional guarantees or letters of credit to sustain the stream of payments or reimburse credit losses. The shortcoming of this type of arrangements is that they create interdependence between the rating of the third party involved and the rating that will be assigned to the instruments. [11]

In particular, the most used types of external credit enhancement are:

[10] Unsystematic risk uncorrelated to the overall market risk, that in huge portfolios can be diversified away

[11] EUROPEAN SECURITISATION FORUM, 2002

- Parental guarantees, that are third parties' commitments to pledge a fund to cover for a maximum amount of losses or lend money to cover for the stream of payments in case of defaults of the underlying loans;
- Letters of credit (LOCs), that are binders released mostly by banks in exchange of a fee in which the third party promises to repay the trust until a given level of losses;
- Surety bonds, which are bonds issued by insurance companies that promise to reimburse the losses of the underlying pools up to a certain amount. Very often this kind of enhancement can be used only in the cases in which the ABS is already high rated, therefore it can be used as a complementary or residual measure;
- Cash Collateral Account (CCA), that is a deposit of cash created through a loan of an enhancement amount granted by a commercial bank to the issuer and used to invest in highly rated short term commercial paper;
- Collateral Invested Amount (CIA), which can be defined as an uncertificated, privately-placed or negotiated ownership interest, which can be bought by investors and that is subjected to a similar subordination structure of the tranches.

Moreover, other financial institutions are often included into the transaction as swap counterparties to hedge against risks related to interest rates and currency.

The last form of credit enhancement (that is more an implication of the very structure behind the securitization) is represented by the bankruptcy remoteness. Since the sale of the assets to the SPV transfers entirely the burden of the credit risk to this entity, which is exclusively involved in the securitization process, the riskiness of these transactions reduces and this implies the achievement of higher ratings.

### *1.2.3 The ABSs under the microscope*

An ABS is "a security that is collateralized by a discrete pool of assets (such as loans, leases, or receivables) and that makes payments that are based primarily on the performance of those assets".[12]

[12] https://www.federalreserve.gov/regreform/reform-glossary.htm

The securitization process can involve many types of assets detained by the financial institutions, but in the US market, it has mainly prospered in the field of the residential mortgages (RMBS).

Since this market comprehends a very wide variety of instruments, it is a very tricky task to decide which is the best criterion to categorize them. Here, it is followed the taxonomy that sorts them on the basis of the type of securitization in which these instruments are involved: the traditional or "true sale" securitization and the "*synthetic securitization*"[13].

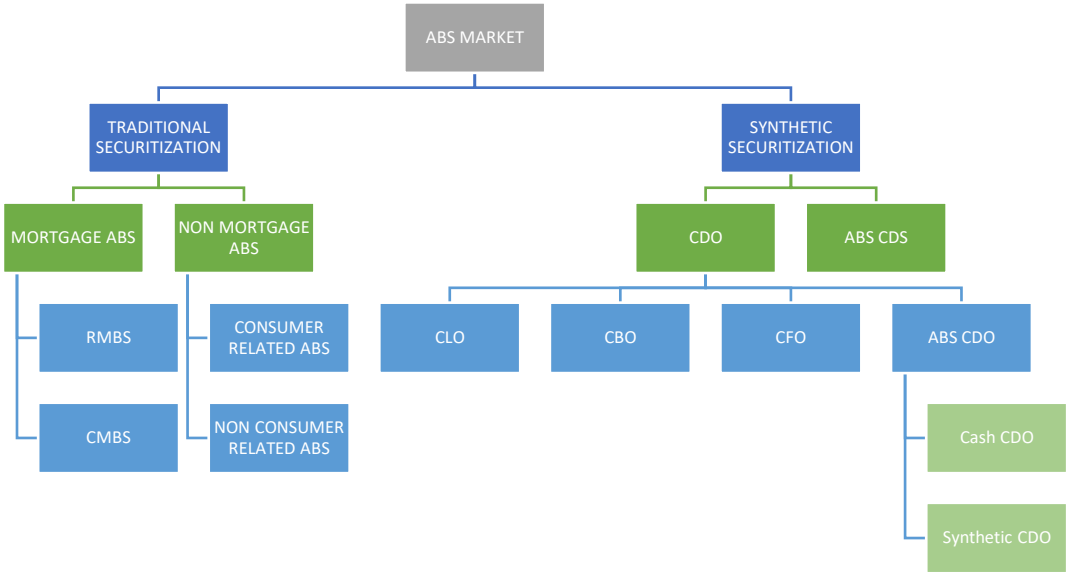


**Figure 2. Categorization of the ABSs classes**

All those ABSs whose underlying are loans, legal rights to specific assets and rights to specific cash flows related to real assets belong to the first group. The main categories of this cluster are:

- Mortgage ABSs, that are ABSs secured by mortgages or pool of mortgages, and can be reclassified into:
    - Residential Mortgages Backed Securities (RMBSs), issued by private labels or by Government entities, whose underlying consists of residential debt (e.g. subprime mortgages and home-equity mortgages);

[13] "Synthetic securitization means a securitization where the transfer of risk is achieved by the use of credit derivatives or guarantees, and the exposures being securitised remain exposures of the originator institution".
Source: https://www.eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/-/interactive-single-rulebook/article-id/1650

    - Commercial Mortgages Backed Securities (CMBSs), which are bonds whose underlying pool is composed of commercial loans granted for the construction of non residential buildings such as offices, factories or malls.
- Non Mortgage ABSs, also called just ABSs, that are bonds usually secured by a heterogeneous pool of different types of loans. They can be distinguished into:
    - Consumer-related ABSs, when the loans composing the pool are loans granted to individuals, as for example auto loans, student loans, credit cards;
    - Non consumer-related ABSs, when the pool is constituted by loans addressed to firms, government organizations, project finance.

The types of ABSs that, instead, belong to the second group are the ones whose underlying assets are constituted by other ABS securities, subordinated debt, SME loans, or obligations to make payments on derivatives contingent to the occurrence of certain triggering events. In particular the principal categories, which will be analyzed more deeply in the next paragraph, are:

- Collateralized Debt Obligations (CDOs) that are debt securities whose underlying is formed from the union of many ABSs of any type, which are in turn collateralized by other pools of cash flow generating assets. Therefore, they create an additional layer in the securitization structure by constructing pools of pools. There are many different types of CDOs traded on the market, among which:
    - Collateralized Loan Obligations (CLOs), whose collateral is represented by ABSs whose underlying assets are commercial bank loans, which typically belong to the category of syndicated loans[14];
    - Collateralized Bond Obligations (CBOs), whose underlying is formed by several pools of junk bonds and other commercial loans both secured

[14] A syndicated loan is a consistent amount of money usually borrowed by a large corporation (either private or public) that is provided by many lenders, who can participate to the operation in different proportions. There are several lead arrangers involved in the transaction, as different commercial or investment banks. It is very common for banks to take part to these transactions with the purpose of quickly sell them through the CLOs

and unsecured. It is a particularly useful instrument since it gives the possibility to transform speculative rated instruments into investment grade ones by pooling them together and exploit the diversification effect that lowers their riskiness;

- Collateralized Fund Obligations (CFOs), which are backed by a pool of hedge fund or private equity investments;
- ABS CDOs, that comprehend cash and synthetic CDOs. They are created from the repackaging of different tranches of MBSs with uniform ratings. In cash CDOs the pool is composed of real assets, while in synthetic CDOs the pool is entirely formed of ABS CDSs;

- ABS CDSs or ABCDSs, that are Credit Default Swaps[15] whose reference asset is an ABS instrument. Indeed, this last category is more an ABS-related class and not ABSs class in a strict sense, but they are widely used for hedging purposes in combination with CDOs.

A peculiar kind of securitization structure is the Whole Business Securitization (WBS). In these deals, the originator pledges as collateral of the issued notes all the cash flows generated by its business such as royalties, revenues, franchise fees, patents. Therefore, there is no a real exchange of a loans pool between the originator and the SPV, but only a loan guaranteed by revenue-generating cash flows.

Another possible transversal distinction among all the types of existing ABSs, can be done between amortizing ABS and non-amortizing or revolving ABSs. The amortizing ABSs are the ones that repay the principal and the interests to the investors during all the life of the security until maturity. In the case of revolving assets instead, such as consumer debt, leases and credit cards, it is very often used a controlled amortization structure: during the pre-established revolving period only the interests are paid off, and after that deadline, periodic repayments are made to pay the principal amount. In some cases, the refund of the principal can also be scheduled as a single payment on a scheduled maturity (hard bullet structure) or on an expected maturity (soft bullet structure). Eventual prepayments made during the revolving period are reinvested into other assets added to the original pool.

[15] A CDS is an insurance contract between two parties in which one party decides to protect against an uncertain credit event, that if it happens, triggers the repayment of a predetermined notional amount

All the types of ABSs instruments expose the investors to different kinds of risks. The most characteristic are the prepayment risk and the early-amortization risk, while the other relevant risks that investors have to deal with are the interest rate risk, the liquidity risk, the default risk.

The prepayment risk is the risk associated with the early and unscheduled return of principal on fixed-income securities that causes the extinction of the obligation. This phenomenon happens when the interest rates experience a decline, which usually makes convenient for the borrowers to repay their debt. The higher the prepayment risk, the lower the expected yield associated to the ABS.

The early-amortization risk generally refers to the revolving ABSs that are exposed to early calls events (e.g. insufficient payments coming from the debtors of the pools, insufficient excess spread or other credit enhancements, a rise in the default rate over specific thresholds, bankruptcy of sponsors or servicers involved in the process). If one of these scenarios occurs, the revolving period and the controlled amortization period end, and all the cash flows are destined to the pay back of the investors on the basis of a new schedule, with the aim to protect the investors from further losses.

The interest rate risk relates to the changes of the ABSs prices inversely related to the fluctuations in the level of interest rates. Clearly, this type of risk affects more the fixed rate ABSs than the floating rate ones.

The liquidity risk expresses how much the ABS is easily traded and sold on the market at a fair price that reflects its true value. It depends on many macroeconomic factors such as the levels of the demand and supply for that instrument, interest rates, vivacity of the market and so on. This risk mostly affects those investors that do not want to hold the ABS until maturity, since they could be forced to sell it at a lower price.

The default risk reflects the risk associated to the inability of the borrower to respect her scheduled payments caused by her bankruptcy. This risk is measured through the rating associated to the instrument, and it is mitigated with the credit enhancement system. Therefore, the default risk is very low for highly rated instruments or tranches and it depends on the quality of the underlying pool. For example, in the case of RMBS, the

quality of the borrowers is specifically measured with some indicators such as the Loan to Value (LTV) ratio[16] and the Debt To Income (DTI) ratio[17].

### 1.3 History of the Asset Backed Securities Market

As mentioned in the previous section, an Asset Backed Security (ABS) is a particular kind of financial instrument collateralized by financial or real activities, typically issued against a securitization process. Banks and other financial institution can use these bonds to transform typical illiquid assets held in their portfolios (such as home equity loans, mortgages, credit card debts, student loans, home equity loans) into easily tradeable resources. By giving away these credits to a SPV, the bank not only expands its liquidity, but also releases all the risks associated to them.

Therefore, the great benefits deriving from the use of the ABSs favors the exponential growth of this market from 1983 until the recent years.[18] As a matter of fact in 2009, the two-thirds of the total home mortgages were held by market-based holdings, such as Government-Sponsored Enterprises (GSEs)[19], for a value estimated to be around $7 trillion.[20]. Their maximal peak is reached in 2006, with the issuance of $4 trillion in the European markets and of almost $16 trillion in the US markets.

[16] The LTV measures the willingness to pay of the borrower. It is the ratio between the amount of the loan granted and the value of the property bought. The higher the ratio, the higher the probability of default of the borrower

[17] The DTI is the ratio between the debt and the income of the borrower. It is a measure of the financial stability of the borrower, that is higher when the ratio decreases

[18] REILLY, BROWN, 2012, page 602 et seq.

[19] A government-sponsored enterprise (GSE) consists of privately held corporations with public purposes created by the U.S. Congress to reduce the cost of capital for some borrowing sectors of the economy and improve their efficiency and transparency. The biggest GSEs involved in the financial crisis are Fannie Mae and Freddie Mac, in step with Ginnie Mae, a government agency

[20] ADRIAN, SHIN, 2010

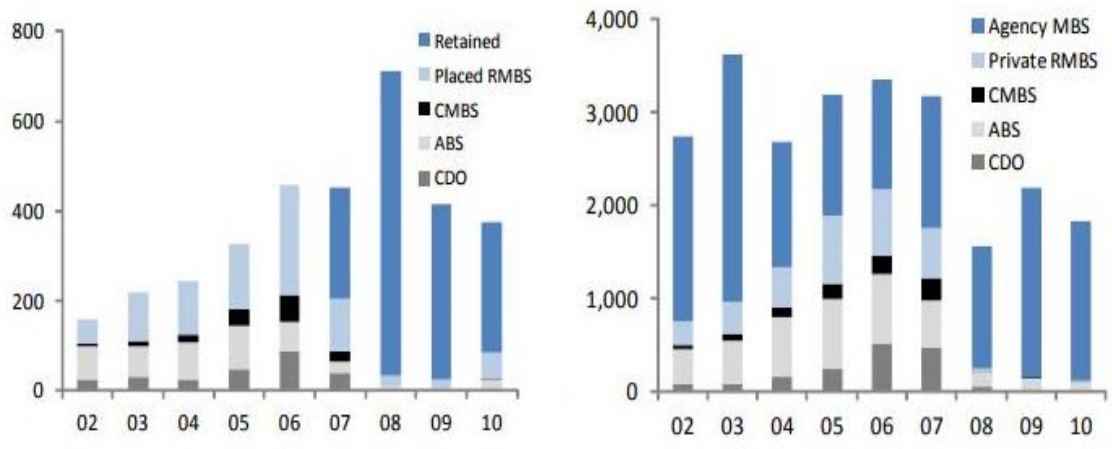


**Figure 3. New Issuance of securitized products from 2002 to 2010 in the Europe (left) and US (right)**
**Source: SIFMA, AFME and Blommestein et al., 2011**

The emergence of the ABS market follows the development of the securitization, whose first example dates back to 1970, when the Ginnie Mae[21] introduced government-insured pass-through securities. These instruments are bonds issued by this government agency with an average life of 12 years (even if the maturity is longer since the prepayment risk is very high) and minimum face value of $ 25,000. They represent an undivided interest in a pool of federally insured mortgages (precisely by the other government sponsored enterprise Fannie Mae[22]) in which the monthly stream of payments includes both the interest and the principal (tax-free). The term "*pass-through*" literally means that the principal repayment is transferred from the borrower to the bondholders by the Agency. Afterwards, even the GSEs Freddie Mac[23] and Fannie Mae will start to issue this kind of securities that technically are not guaranteed by the government even if issued by a public organization, but in practice, they are.

The structure of these bonds provides that the interest payments on the mortgages are used to pay the interests to the investors (which are therefore variable) and the principal repayments are addressed to the repayment of the principal amount of the bonds. The benefits deriving from this kind of contract are the extreme liquidity, the very low riskiness of the instrument on the hand of the investors, and the reduction of the risks

[21] Government National Mortgage Association (GNMA)
[22] Federal National Mortgage Association (FNMA)
[23] Federal Home Loan Mortgage Corporation (FHLMC)

borne by the bank combined with the possibility to reinvest the new liquidity gained on the hand of the lenders. The consequences on the markets were the substantial reduction of the borrowing costs and the easing of the access to credit for the households.

For the first time in 1977, there is the issuance by a private institution (Bank of America) of a mortgage pass-through instrument, while it will be only in 1983 that a Collateralized Mortgage Obligation (CMO), belonging to the MBS class, will appear on the market. This is the conventional date set up as the starting point of the ABS market that will quickly develop in the following years.

The CMO is generally issued by a Real Estate Mortgage Investment Conduit (REMIC)[24] with the aim to reduce the uncertainty related to the timing and the amount of the payments through a sequential distribution process. The use of this kind of structure allows the creation of many bonds with different characteristics in terms of maturity that can capture the different needs of much more investors on the market.

The fundamental news introduced are the tranches; different classes of bonds with progressive maturities are issued against the same underlying securities (i.e. mortgages guaranteed by Fannie Mae and Freddie Mac):

- The class A is characterized by bonds with the shortest maturity and the lowest level of risk. The first principal repayments and prepayments of the collaterals are absorbed by this class until all these securities are paid off and they receive regular interest payments;
- The class B and C have a medium maturity and the principal is repaid after the whole retirement of the class A bonds, but in the meantime they also get interest payments at the predetermined dates;
- The class Z has the longest maturity and consists of accrual bonds. The accrual bonds do not pay interests until maturity, or alternatively until a specific date (e.g. the date in which all the other classes with shorter maturity are repaid integrally) in which they start to pay both interests and principal based on the actual level of interests and principal accrued until that moment. Therefore, they have a higher level of interest risk but a very low level of reinvestment risk[25].

[24] The REMIC is a specific kind of SPV that pools together mortgage loans in order to issue MBSs

[25] The reinvestment risk is the risk associated to the fact that the interests generated by the investment of a certain amount of funds will be reinvested at a lower rate than the one at which the funds were originally

Hence, there is the passage from a pass-through process to a sequential distribution method in which the repayment of the principals and the interests follows a prioritization scale based on the tranches: the waterfall. Being instruments collateralized (and very often over collateralized) by mortgages guaranteed by the Federal Agencies, the CMOs have been typically valued with triple-A ratings but promised higher yields with respect to the A-rated industrial bonds.

These new financial techniques will incentivize the expansion of the ABS market until the financial crisis, especially in the sectors of home equity ABS, student loan ABS and Collateralized Debt Obligations (CDOs).

A CDO is another type of security already mentioned earlier, very similar to the CMOs that rapidly prospered in the ABS market from 2000 on. The peculiarity of this kind of instrument relies on the fact that, differently from the other ABSs classes, its underlying assets consist of a heterogeneous pool of assets that can contain bonds with different ratings, emerging market bonds, domestic bank loans, residential and commercial mortgages and other CDOs (in this case a more correct definition for this instrument is $CDO^2$). For example, a subprime CDO has a pool composed of mezzanine tranches of ABSs that have rating lower than triple-A. The process involving this kind of instruments goes under the name of resecuritization, since there is the transfer of a title composed of already existing securitized assets.

As well as the CMOs, this pool of assets is divided into tranches, but in this case, they differ for the credit quality. In fact to each tranche, it is associated a different default probability (PD)[26] and therefore, a different level of risk:

- The senior tranches (usually the 80% or more of the CDO) have the lowest PD and high ratings (usually AAA), so they are the least risky instruments and will experience losses only after that the other tranches will have absorbed the losses caused by the eventual defaults. They are characterized by not very high yields, but still higher than the A-rated industrial bonds;
- The junior (or equity) tranches have the highest PD and speculative ratings, therefore they are very risky instruments that promise high yields, but they are

invested. It is linked to the prepayment risk, since it usually happens when the interest rates are declining and principals are being repaid in advance

[26] The probability of default is a probability measure that expresses the likelihood that a borrower will not repay its debts

also the tranches that will experience losses before all the other ones in case of defaults.

The waterfall of the CDOs can be very difficult to understand since many triggers about interest coverage and collateralization can regulate it.

All the tranches of these particular instruments will become very illiquid during the crisis, since an increasing number of subprime MBSs will end up in the pools of assets used by the CDOs, that nevertheless were registering high-level ratings, as shown in Figure 4. The plot shows the percentage of the CDOs ratings with respect to their par values:

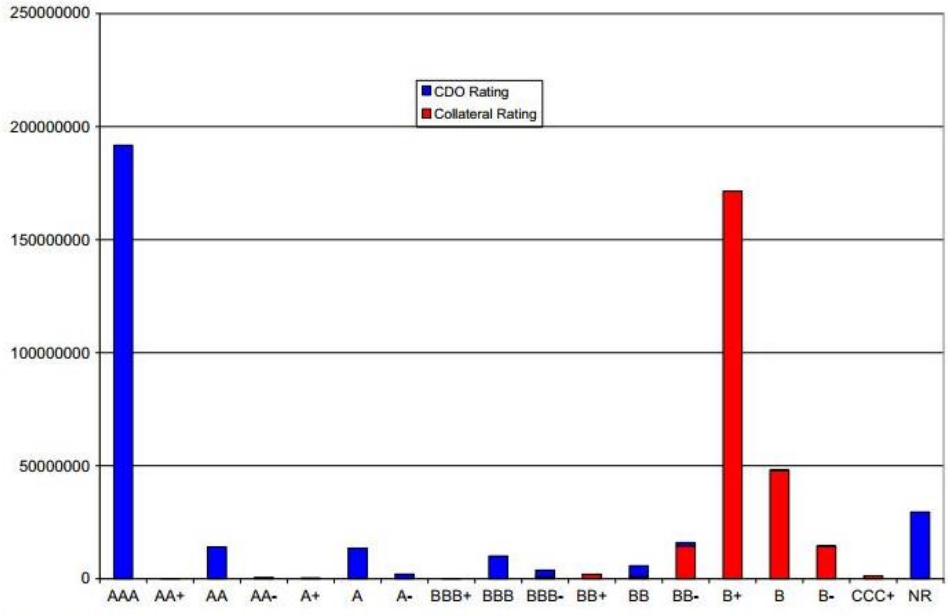


**Figure 4. Comparison between CDOs rating and average collateral rating in a sample of 2007**
**Source: Benmelech et Dlugosz, 2009**

### 1.4 The role of the ABSs in the financial crisis

In order to have a clear picture of what is the situation of the ABS market today, it is necessary to take a step back and briefly analyze the causes that led to the financial crisis, which conventionally begins with the failure of Lehman Brothers on 15$^{th}$September 2008.

Actually, the first tensions registered on the markets are dated back to August 2007 when the interbank market began to halt in response to the lack of trust spread among the banks about the solvency of the other counterparties. The spread between the interest rates of the safest securities, such as Treasury bonds and the riskiest assets gradually widened,

and the banks commenced asking for more liquidity to the central banks both in European Union and in US.

The starting point that has generated the crisis is the swell of a bubble in the residential housing sector from the early 2000s. Three main economic forces have originated this phenomenon:

- The 2003 American Dream Downpayment Act, whose purpose was to raise the homeownership rate in US through the ease of the access to credit;
- The passage from the originate-to-hold model (OTH) to the originate-to-distribute (OTD) one, that allowed the securitization of the assets detained in the banks' balance sheets;
- The extreme lowering of the interest rates pursued by the FED after the stocks prices decline due to the terrorist attack of 2001 and the outburst of the tech bubble.

This framework produced the perfect conditions for the precipitous increase in the houses demand that consequently have caused the rising of the prices and growth in the number of loans granted from the banks to the households.

At first, the process is slower, but then, this tendency becomes much stronger and the banks start to grant loans to borrowers that have an always-lower creditworthiness, exploiting the fact that the credit risk will not be borne by the bank itself (the originator) that has the possibility to sell the mortgages to the SPVs.

Therefore, the demand for the "*new*" instruments such as ABSs, CDOs, CDOs$^2$, ABS CDSs intensifies together with the increase in the house prices. The mortgages that end in the pools used as collateral of these securities are for the vast majority "*subprime mortgages*" (i.e. mortgages granted to individuals with a very low FICO[27] score inferior to 650).

The great demand for derivatives backed by subprime mortgages has been influenced by two principal factors: the short-term bonus incentives for the management of

[27] The FICO is "a way of measuring an individual's creditworthiness. A FICO score is a quantification of a variety of factors in an individual's background, including a history of default, the current amount of debt, and the length of time that the individual has made purchases on credit. A FICO score ranges between 350 and 850. The term comes from the Fair Isaac Corporation, which created the system"
Source: https://financial-dictionary.thefreedictionary.com/FICO

investment funds and financial institutions, and the incentive problems relating the payment of credit rating agencies.[28]

The first cause relies on the fact that proprietary trading group managers receive a high percentage of their income in the form of yearly bonuses related to the short-term trading performances. For this reason, their interests are not perfectly aligned with the ones of the investors and there is the onset of an agency problem. Even if the managers knew that the risks of the structured debt were not comparable to the ones of the equally rated Treasury bonds, they relied on the assigned ratings anyway, in part because those instruments were difficult to understand, and in part because they promised higher yields (and consequently a higher compensation for themselves). This mechanism generated very risky and interconnected exposures also in the money market mutual funds.

The second cause, instead, can be identified in the behaviour of the rating agencies, badly influenced from the fact that these entities were and are still paid by the same clients whose securities are object of their valuations. Therefore, the misrating of those securities has been partly caused by the conflict of interest they were facing at the time, but also partly due to the poor models used to estimate the default risks of the structured debt instruments. The devastating result has been that even the riskier misrated instruments ended up in the portfolios of many pension funds and financial institutions that had not sufficient capital to cover for the losses that eventually they realized with the burst of the bubble and ultimately caused their failure. Moreover, this misrating also permits the proliferation of instruments like the CDOs and CDOs$^2$ that exploited the "*rating arbitrage*" opportunities. In fact, the costs associated to the creation of these instruments are quite significant in terms of fees paid to the investment banks, ratings, and legal issues. The only reason why these CDOs were traded so intensively on the markets before the crisis has been their overvaluation: in reality they were junk bonds that paid high yields but they were AAA-rated, and the financial institutions or funds were disposed to overpay for these instruments that allowed to make above average returns, at least in the short term period.

The request for the CDOs grows so much and so fast that the ABSs bonds on the market used as collateral become too few. In order to face the growing demand, another type of instrument diffuses in the markets: the ABS CDSs.

[28] JARROW, 2012

As already mentioned, a Credit Default Swap (CDS) is a derivative contract between two counterparties in which one party (protection buyer) purchases an insurance from the other party (protection seller) against the eventual insolvency of a debtor, committing itself to a fixed periodic payment usually expressed in basis points of a notional amount. In case of default of the debtor (credit event), the protection seller will be obliged to pay the notional amount to the protection buyer. This swap allows the transfer of the credit risk associated to a certain security on the market between the two parties. Both the buyer and the seller can subscribe the contract without holding the instrument against which the insurance is made: in this case the swap takes the name of "*naked CDS*".[29] The buyer of the CDS takes a short position on the credit risk underlying the debt. In the case in which she wants to take a short position on the debt, it will be enough to go short also on a Treasury bond with the suitable maturity to replicate the exact cash flow that she would obtain from the direct short sale. Therefore, the CDSs make a lot easier and less costly the short selling of the debt.

In particular, two types of event can activate the payment of the seller in an ABS CDS:

- A credit event, that ends the contract with the physical settlement (payment of the remaining value of the principal in exchange of the debt issue) or the cash settlement (payment of the difference between the value of the remaining principal and the market value of the debt);
- A floating amount event (PAUG settlement[30]), that is caused by a principal or interest write-down or write-up[31]. In these cases, defined as "*soft credit events*", since they do not cause the default of the debtor but only affects the stream of cash flows, it is provided a floating payment by one of the two counterparties in order to partially settle the contract. In this way, there is a more faithful replication of the ABS trend.

[29] Source: http://www.borsaitaliana.it/bitApp/glossary.bit?target=GlossaryDetail&word=Credit%20Default %20 Swap

[30] Pay as You Go is a new form of settlement born to overcome the difficulties in the physical settlement (due to the fact that ABSs are securities) and cash settlement (due to the fact that the market price of ABSs is hard to estimate)

[31] A write-down is a decrease in the book value of a security or note because it is overvalued in comparison to its market value. On the contrary a write-up is an increase in the book value of the security or note since it is undervalued with respect to its market price. Therefore they cause respectively a decrease or an increase in the notional amount of the instrument

Before the crisis began, financial institutions have issued these instruments, mostly with the aim of not posting additional equity capital or collateral. The excess of supply linked to these CDSs is partly allowed by the incorrect evaluation of the risks related to these swaps and partly caused by the indulgent collateral requirements imposed to the financial institutions.

Associated to this kind of products, there is also the spread of another type of instruments: the synthetic CDOs. They are CDOs in which the collateral pool is composed entirely of ABS CDSs, so no physical bonds are included in it. Even in this case the pools are segmented into credit tranches that receive payments based on the CDSs cash flows. The risk levels are defined on the basis of the total accumulated loss verified in the pool. The tranches have attachment and detachment points that indicate the percentage thresholds of losses on the notional amount of the swaps that will be absorbed by the considered tranche of the synthetic CDO. Once the detachment point (maximal limit) is reached, the tranche is wiped out. Their great success on the market has been related to their lower cost of constructions with respect to cash CDOs[32].

However, this period of exponential economic and financial growth could not last forever: every economic bubble eventually bursts out, no exceptions made. In fact, from 2006 the houses prices start a rapid decline: by then, the subprime borrowers were too few to sustain the demand of the house market; the inflation rate started to increase due to the intensification of budget deficits; the oil prices caused the increase in gas prices.

Since the vast majority of subprime borrowers had stipulated adjustable rate mortgages (ARMs)[33], they initiate to become insolvent when the interest rates go up. The increasing number of defaults on these mortgages triggers a chain effect: even the senior tranches of the structured debt considered safe (and ended up in a massive way into the portfolios of many institutions and funds) lose their values and suffer a severe downgrade. The financial markets freeze and all these instruments become suddenly illiquid, driving many institutes to fire sales of these assets (that extremely increased the price volatility). The

[32] As already explained, cash CDO is any CDO whose collateral is formed by the real assets like loans or bonds

[33] "A mortgage with an interest rate that changes periodically. Generally speaking, an ARM is linked to some major benchmark rate. The mortgage may or may not have a cap on how much the interest rate can rise or fall, or on how often the interest rate may change. Very often, the initial interest rate (teaser rate) for an ARM is lower than that for a fixed-rate mortgage"
Source: https://financial-dictionary.thefreedictionary.com/Adjustable+Rate+Mortgage

capital posted was not even closely sufficient to bear the losses, and very soon, many financial institutions start defaulting, forcing in many cases the Governments to intervene with bailouts[34] as in the case of the GSEs. This chain of events has a strong impact on the real economy, causing the start of the "*Great Recession*" that quickly diffuses overseas too.[35]

### 1.5 The structured debt market after the crisis

The fundamental guilt of the structured debt, wrongly exploited and misjudged by the main actors of the markets, has been the broadening of the real-estate bubble to a financial level. The securitization process has amplified the magnitude of the effects of the crisis on real economy through the impact on many factors[36]:

- The lengthening of the intermediation chain, that leads to a higher potential instability;
- The misaligned incentives between the actors of the securitization chain and the market, fed by the impairment of the due diligence process (both ex ante in the selection of the eligible borrowers and ex post in the phase of monitoring)[37], that endorses the creation of highly risky instruments;
- The complex structure of the financial products, like in the case of synthetic CDOs, that shadows the collaterals' effective quality and makes very intricate for investors to understand what they are really buying;
- The overreliance on mathematical models and external risk assessments, that are based on historical data, and therefore not capable of correctly estimate the true value of the new products. Moreover, the decrease in the risk faced by the rating agencies gives them the right motivation not to care even if they thought there was some deficiency in the model;
- The increase in individual and systemic bank risks, caused by the exploitation of the high yields to realize short term profits by purchasing with borrowed

[34] A bailout is a rescue operation of a financial institution in order to avoid its bankruptcy made by the Government using the money of the taxpayers. In this case the costs of the "crisis" of the institution falls back on all the contributors
[35] D'ORLANDO, 2012
[36] DELIVORIAS, 2016
[37] ALBERTAZZI, ERAMO, GAMBACORTA, SALLEO, 2011

money more securities, but exposing themselves to greater interconnection risks.

From 2007-08 on, all the securities belonging to the structured debt sector experience a huge fall of their prices all over the world and the ABS market slumps: the supply increases and nobody wants to buy them since the collaterals are mostly mortgages that will not be repaid by the borrowers.

The default performances of the securitized products during this period vary with the asset classes considered: in the US market the triple-A rated subprime RMBSs and CDOs register a default rate equal to 16% until 2009, while the CMBSs only recorded a default rate under 2%. If the BBB-rated instruments are considered, the default rates respectively increase to 60% and 20%.[38]

This fact transpires also from the losses observed in the different clusters of structured debt: US RMBSs, US CMBSs and EMEA CMBSs are the most affected classes, while the RMBSs and ABSs issued in EU have almost no losses in the period from 2007 to 2009. Therefore, the shrink of the market is more driven by the fear of the investors than the effective losses registered: as a matter of fact, the expected losses are much greater than the realized ones in all the asset classes.

After this stage of intense crisis though, both in Europe and in the US markets, there are signs of a slow recovery, but as it can be observed from the data, especially when it comes to the European case, the composition of the collaterals results extremely changed. Real-economy-related ABS represent the dominant share in the sector: credits like leases and auto loans collateralize the vast majority of the "*new*" structured debt, while the mortgage loans have just a residual role on the market. Moreover, the preferred type of conduits is now the multi-seller type (in which more than one originator is involved) since this category has experienced far less losses during the crisis period, and the issuance is supported almost entirely by liquidity facilities in order to mitigate the credit risk.[39]

[38] EBA, 2014

[39] A liquidity facility is "a letter of credit, standby bond purchase agreement or other arrangement used to provide liquidity to purchase securities, typically variable rate demand obligations. The provider of the liquidity facility, typically a bank, purchases the securities (or provides funds to the issuer) until such time as they can be remarketed". Usually they cover for more than the maximum volume and have maturity of one year
Source: http://www.msrb.org/Glossary/Definition/LIQUIDITY-FACILITY.aspx

Consequently, the ABS market and the structured debt market have become much safer and solid after the lesson harshly learned with the financial crisis, but despite this evidence, they are very far from reaching again the dimension they had in the pre-crisis period.

One partial explanation to this phenomenon rests on the regulation activity of the European and American legislators of the latest years, which has maybe been too punitive towards this market in comparison to others, such as the covered bonds[40].

### 1.6 A literature overview on securitization

In the latest years, many authors have found an interest in analyzing the effects of the securitization on the markets, especially when it comes to the most diffused class of subprime RMBSs in the US market. In fact, they have been deeply influenced by the financial crisis of 2007, which has brought to light some major inefficiencies linked to the securitization process.

Securitization has been very often depicted as the major responsible of the World economy failure, although as it has been previously clarified, this is not completely true. The prevalence of literature and works available reflects this current.

Primarily, the papers investigate how the process is affected from the moral hazard and the adverse selection issues, two concepts that were firstly introduced by the Nobel Prize Akerlof[41].

The risk of moral hazard intervenes in the post-contractual phase. When a party decides to enter into a contract in bad faith, she can deliberately decide to take reckless conducts and expose herself to greater risks than the ones provided by the contract terms, in order to exploit the asymmetric information (i.e. the inability of one party to control the behavior of the other and profit from these actions). In the granting loan process, the lenders can decide to give loans even to borrowers that do not fit with the credit lending standards[42] of the bank to get more commissions or other incentives, encouraged from the

[40] Covered bonds are very liquid securities issued by banks, which are guaranteed by a specifically destined portion of the institution assets. Therefore they are considered safer instruments with respect to ABSs
[41] AKERLOF, 1970
[42] This is the case of the so-called "*liar loans*", granted without asking for the proof of the borrowers' incomes or status, or of the NINJA mortgages, i.e. loans granted to individuals with No Income No Job or Assets

fact that these loans will not be held in the balance sheet of the bank but will be sold. On the other hand, also the borrowers can become more risk tolerant and take behaviors that could endanger their properties, incentivized by the triggering of the insurance payments.

The adverse selection problem arises in the pre-contractual phase, when one of the two counterparties hides relevant information to the other, in order to get more favorable contract terms. In the securitization process, this issue occurs when borrowers give misleading information about their actual financial situation, since in many cases the due diligence completed by the advisors is careless. One of the major consequences of this issue is the general lowering of the borrowers' quality, because it comes to be more convenient to the uncreditworthy individuals asking for loans since they will probably get the same interest rates of the creditworthy ones. Therefore, all the more informed investors will not expect a high-quality loans in the pools of ABSs and they will be disposed to pay low prices for these instruments. The primary lender institution, aware of this mechanism, will retain all the higher quality ABSs in its own portfolio because it knows that it will not be able to place them at a fair price on the markets. Ultimately, the consequence of this "*self-selection*" chain effect is that only the lower-quality ABSs will be traded while the higher-quality instruments will be excluded from the market. Among others, this process has been deeply studied even before the financial crisis, in the papers of Pavel[43] and Greenbaum et Thakor[44].

Two main aspects of great importance are considered in most of the recent literature. On one hand, some authors have studied the above-mentioned effects on syndicated loans; while on the other hand someone else focuses on the measurement of the willingness of the parties involved in the process to monitor and screen the pool of loans granted at first, and then, assess the composition of the pools created.

Remarkable papers about the syndicated loan market are: the study of Focarelli et al.[45] in which it is empirically demonstrated that the interest rates required by the investors are inversely related with the concentration of the syndicates, since the investors' trust increases; Sufi's work[46] concentrates on the variation of the syndicated loans structure, finding that when borrowers require an intense due diligence, the lead arranger (i.e. the

[43] PAVEL, 1986
[44] GREENBAUM, THAKOR, 1987
[45] FOCARELLI, POZZOLO, CASOLARO, 2008
[46] SUFI, 2007

informed lender) tries to achieve it by increasing the exposure to the loan and retaining a larger portion of the loan by forming a more concentrated syndicate; Benmelech et al.[47] instead put attention in the analysis of CLOs, in order to prove that adverse selection does not influence much more the performance of securitized assets compared to the unsecuritized loans with the same credit quality, that in some cases perform even worse. The reason behind this evidence may be the fact that the incentives in syndicates reduce the arising of adverse selection problems.

The most important papers concentrated on the willingness of lenders to undertake due diligence processes are shown below following a chronological order. Krainer et Laderman[48] demonstrate that the securitized loans of the GSEs are less risky than the ones issued by private SPVs, but the investors do not choose between the two options relying on this fact but on the basis of other factors; Keys et al.[49] work of 2009 focuses on how the moral hazard effects can be discouraged, finding that retaining a certain share of the securitized assets and highly regulated originators have positive influence on the lenders' behavior; in other studies of Keys et al. conducted in 2010[50] and 2011[51], it is found empirical evidence of the fact that the securitization process has had a negative effect on the loan quality level (measured through the FICO score) and on the lax of the screening standards applied.

Another point analyzed by many authors, such as Caprio et al.[52], relates to the causes of the CRAs misratings. The results show that it is correlated to the incentive problems (especially related to the fees system), but also to other exogenous related factors, such as the structure of the market and the regulation environment, the complexity of the instruments rated.

In conclusion, understanding whether the ABSs and the securitization process expose the players on the markets to an intolerable risk or not is a tricky question that has not an easy and unique answer. The aim in the next chapters will be to explain the benefits that it could create if used properly, particularly in the European context, analyzing the role and the effects of the regulation on the correct development of the structured debt market.

[47] BENMELECH, DLUGOSZ, IVASHINA, 2011
[48] KRAINER, LADERMAN, 2009
[49] KEYS, MUKHERJEE, SERU, VIG, 2009
[50] KEYS, MUKHERJEE, SERU, VIG, 2010, 2010
[51] KEYS, MUKHERJEE, SERU, VIG, 2011
[52] CAPRIO, DEMIRGÜC-KUNT, KANE, 2008

# CHAPTER 2
# THE BARRIERS TO THE DEVELOPMENT OF THE ABS MARKET

## 2.0 Purpose of the chapter

The second chapter of this work aims to enlighten the characteristics of the securitization process that make it so valuable for the correct growth of the economy.

The first section emphases the key advantages that it produces for all the actors of the economic systems, whereas the second part concentrates on a systematic review of the public interventions promoted by the US and EU regulators to eliminate all the inadequacies detected with the burst of the financial crisis. The conclusive section observes the major obstacles created by the regulatory measures for the correct development of the securitization market, especially in the European Union in which the road to redemption seems to be still long.

## 2.1 The benefits arising from the securitization process

Once understood which are the main features that characterize the securitization process and the risks it might involve, it is now important to comprehend the many advantages it can potentially bring to all the stakeholders on the markets and the economic system in general.

The main positive effect relates the originators of the loans composing the asset pool: they can use securitization in order to increase their funding activity and lend more money to the real economy, benefiting from the removal of those assets and the relative risk from their balance sheet. In fact, they can reduce the capital reserves imposed by the Regulators, and use them to increase their leverage. This process, which has a positive impact on the risk management of the institution, can generate value for the institution itself that can achieve greater profits and reduce the cost of intermediation by capturing part of the lending profits, for the shareholders of the originator, and ultimately for the whole economy of the country.

In addition to the relocation of the credit and the interest risk, securitization is a powerful tool used to transfer of the servicing risk, i.e. the uncertainty the loans are not serviced in a timely and efficient manner. This involves controlling and monitoring the

delinquencies, collecting taxes, paying the investors and so on in order to limit the losses during the life of the loans. Potentially excessive servicing fees in this case can represent a drawback.

Moreover, the financial institution can create securities that can be resold in the markets instead of being held until maturity, giving the chance to segment and redirect the stream of cash flows. Therefore, it improves the control on the balance sheet and improves the Asset-Liability Management (ALM)[53], which leads to a decrease of the liquidity risk. Indeed, the ABS securities often bear contractual legal maturities at least as long as the longest maturity asset present in the underlying pool.

The issuers can take advantages from the reduction of the interest costs[54] and the increase in efficiency, achieved with the separation of the securitized bonds rating and the rating of the single loans. The phenomenon of the improvement in the credit conditions mostly depends on the benefits arising from the diversification effect: typically, these institutions pay a lower interest rate to the investors of the ABS products (highly rated) than the one that they receive in the loan contract from the original borrower, considered as a riskier position.

Even the investors can get diverse benefits from the process. First of all, the securitization offers more retailed investment opportunities since it widens the variety of products offered on the market, each one characterized by different risk-return profiles and maturities, and therefore, the investor base. Furthermore, these instruments also offer higher yields with respect to equally rated securities and, for this reason, they can be used for different strategies purposes. Very often, investors use the floating rate ABSs to profit from the spread between a low rate funding cost and the higher rates of these instruments; more conservative investors, such as pension funds, can use the fixed rate ABSs to achieve above average returns with a highly rated instrument.

Other positive impacts can be achieved on the markets: the widespread of the risk among different actors on the market can reduce the individual risk borne by the individual entity, and they can also improve the efficiency of the price formation of the

[53] ALM is the mechanism used to mitigate the risk faced by a bank due to the mismatch between assets and liabilities in terms of liquidity in the case of different maturities, or in terms of interest rates in the case of different fixed and floating rates used
Source: ORACLE FINANCIAL SERVICES, 2008, "Asset Liability Management: An Overview", in *An Oracle White Paper*

[54] The interest cost is the cumulative sum of the amount of interest paid by a borrower on a loan

underlying assets, that are usually more difficult to be evaluated. In this sense, the price at which the ABSs trade can be used as a benchmark for the true value of the assets composing the pool, even in the case in which they are traded individually[55]. Moreover, the asset encumbrance required for the over-collateralization of the ABSs is lower with respect to other classes of investments such as covered-bonds: this is a positive thing in times of crisis, since the investors know that they have a higher quantity of unencumbered assets to liquidate in the bad case scenario of financial troubles.

Finally, the securitization can also bring many advantages for the overall economy: as enlightened in many studies, it favors the decrease of geographical and regional disparities through the improvement of the access to credit in terms of quantity and costs as a direct consequence of the secondary market efficiency. The spreading of the risks among different counterparties has a positive impact on the individual and systemic levels of risk [56].

Therefore, securitization can be seen as a strong tool that can help the stimulation and the support of the economic growth in a variety of sectors.

One of the key asset classes in which the peculiarities of the securitization can enhance the growth and the efficiency of the market is the SME loans[57] area, which is a particular market segment especially present in the European Union.

It is not clear whether the securitization leads to positive effects in the relationship between the single lenders and the individual SME borrowers, whose loans will be securitized, since the risks associated to that exposure stand no matter who is bearing it and the financial conditions do not change. But, in any case, securitization releases liquidity that can be used to grant SME loans, thus the SME loans market becomes more active since the originators are willing to buy those assets and consequently this situation better disposes the bank to grant this kind of loans generating a more efficient pricing.

For all these reasons, securitization can be also seen as an aid to improve effectiveness of the SME loans market, both in terms of size and efficiency.[58]

[55] LEVINSON, 2005, Chapter 5

[56] EUROPEAN SECURITISATION FORUM, 2002

[57] A SME loan is the financing of a small or medium-sized enterprise through the concession of a line of credit. It is comprehended in the wider category of the SME financing, that includes all the forms of financing that can be used by a SME such as bond or equity issuances, leasing, factoring, venture capitals and so on

[58] EUROPEAN COMMISSION, 2004

From this brief overview, it can be concluded (and it is generally acknowledged) that well-regulated, good quality and less opaque securitized products can play an important role in the worldwide markets. In one sentence, "prudently-designed" ABSs can be the key to unlock and restart the economy.

## 2.2 The regulation of the ABS market after the financial crisis

During the years after the burst of the financial crisis, the regulators of all the world have committed in pursuing a more robust financial system. The following chronological analysis is going to focus on the interventions made in the US and EU markets, explaining all the efforts that have been made by the authorities in order to restore and enhance the functionalities of a healthy securitization market, but also enlightening that their extreme caution might be an obstacle for its correct development. In fact, it is acknowledged that the ABSs play a fundamental role in the support the supply of credit; therefore, a series of measures have been implemented with this purpose.

The review will be limited only to those operations that somehow have affected directly or not the ABS market, but it will not be extended to all the conventional and unconventional monetary policies undertaken by the central banks during this period of financial turmoil.

The main area targeted by these new reforms concerns more prudent capital requirements of the financial institutions to strengthen their resiliency, but some other initiatives have also focused on establishing facilities designed to improve the liquidity of the securitized products.

### *2.2.1 Regulatory measures adopted in US*

The first intervention of the US regulator, namely the Board of Governors of the Federal Reserve (FED)[59], are dated back to August 2007, when it becomes clear that the growth of the economy is too slow and the downside risk is high. In the speech at the Economic Club of New York on October 15th 2007, the Chairman of the FED B.S. Bernanke begins by saying:

[59] "The Federal Reserve, the central bank of the United States, provides the nation with a safe, flexible, and stable monetary and financial system"
Source: https://www.federalreserve.gov/aboutthefed.htm

"*The past several months have been an eventful period for the U.S. economy. In financial markets, sharpened concerns about credit quality induced a retrenchment by investors, leading in some cases to significant deterioration in market functioning"*.[60]

In fact, in this period, banks are not willing to lend to each other because their balance sheets are full of different types of ABSs, which were experiencing a huge downgrade, causing their possible insolvency. As a result, the interbank market freezes and the banks start having liquidity issues and ask for more and more borrowings to the FED lending facility.

Therefore, the FED decides to signal to the market that it is ready to intervene if the situation becomes critical with the press release of August 17th, and then it starts to progressively decrease the target fund rates[61] and the discount rate[62]. In December 2008, they will assess respectively to 0 - 0.25 % and 0.5 %[63] through the actions on the discount window facility[64]. This operation was aimed to ease the access of banks to short-term loans and contrast the "*credit crunch"*[65] phenomenon.

However, these preventive measures are not so effective, since the lack of trust and the inability to assess the capability to pay of the counterparties exacerbate with the failure of the Lehman Brothers in September 2008. From that point on, an irrational fear pervades all the markets: the ABSs prices fall causing the skyrocketing of the yields and "*fire sales*"[66], and their issuance completely stops. The instruments held in the portfolios of the institutions suddenly become worthless and they find themselves without the necessary capital to absorb the losses. Additionally, the discount window facility provided penalizing treatments of the securitized instruments with even doubled haircuts vis-à-vis

[60] Source: https://www.federalreserve.gov/newsevents/speech/bernanke20071015a.htm
[61] The federal fund rate is the overnight interest rate required by the financial institutions for the interbank operations. The federal fund effective rate is the weighted average rate of all these transactions among these financial counterparties
[62] The discount rate is the interest rate that the FED's lending facility applies to all the depository institutions
[63] Source: https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20090113a1.pdf
[64] "The discount window helps to relieve liquidity strains for individual (eligible) depository institutions and for the banking system as a whole by providing a reliable backup source of funding". It provides different interest rates for different classes of depositories, distinguishing in primary, secondary and seasonal credit
Source: https://www.federalreserve.gov/regreform/discount-window.htm
[65] The term credit crunch indicates a significant decrease (or a sudden exacerbation of the conditions) of the loans' offer, usually subsequent to a recession phase that follows a period of huge economic growth
[66] A fire sale consists in the liquidation of a firm's asset at a price prices far below its fair market value (FMV) to achieve a quick sale, either to avoid a financial disaster or to repay the debts of an insolvent or bankrupt firm

with the ones asked for covered or corporate bonds. Along with the failure of many financial institutions such as Washington Mutual and IndyMac, many others receive individuals aids from the FED that allowed their salvage through the granting of loans and the constitution of SPVs, e.g. the cases of Bearn Stearns and the American International Group (AIG).

Broader open market operations (OMO)[67] in the ABS market start in November 2017, when the FED announces the undertaking of a program for the purchase of $100 billion in GSE direct housing-related obligations through a series of competitive auctions conducted by its primary dealers, and the purchase of up to $500 billion in MBS, conducted by selected asset managers.[68] These interventions, that protracted until the temporary halt in June 2010 (when the FED arrives to detain more than $ 1.1 million of MBS in its balance sheet, the highest level reached until then), were able to mitigate the lack of liquidity of those institutions with untradeable securities in their balance sheets and prevent huge losses due to their sell-offs. This is just the first of the four interventions that go by the name of "Quantitative Easing" (QE), i.e. financial maneuvers that cause an expansion of both the balance sheet of the central bank and the monetary base in the economy without altering the nature of the assets held. On the contrary, this is the result of the qualitative easing operations, which modify the composition of the type of assets in the balance sheet of the bank.

Contemporarily, the FED also undertakes other two enhancements with the aim to provide further liquidity to the market during September and October 2008, both concluded after several extensions in February 2010:[69,70]

- The institution of a liquidity facility for the purchase of high-quality ABCP held by money
- market mutual funds, briefly called AMLF, in order to help them to meet the investors' claims;

[67] Open Market Operations are purchases and sales of securities in the open market by a central bank in order to pursue its objectives of monetary policy. They can be both permanent and temporary measures
[68] Source: https://www.federalreserve.gov/newsevents/pressreleases/monetary20081125b.htm
[69] Source: https://www.federalreserve.gov/newsevents/pressreleases/monetary20080919a.htm
[70] Source: https://www.federalreserve.gov/newsevents/pressreleases/monetary20081007c.htm

- The Commercial Paper Funding Facility (CPFF), consisting in a newly created SPV to buy unsecured "*legacy*"[71] asset backed securities from eligible counterparties with three-month maturity, in order to sustain the commercial paper segment, exposed to an increase in the interest rates due to the shrink of the outstanding volumes of these instruments.

Furthermore, on October 21st the FED reveals the beginning of another intervention with the same extent to help the liquidity to the money market investors: the Money Market Investor Funding Facility (MMIFF), through which the FED can finance some eligible SPVs with senior secured funding to assist their purchase of eligible assets from eligible investors. The operation ends one year later, after a prorogation.[72]

In the following months, the most relevant measure adopted to support and stabilize the ABS market is the Term Asset Backed Securities Loan Facility (TALF).[73] This facility, partly financed with the TARP[74] funds, is a loan program aimed to restart the issuance of highly rated CMBS instruments collateralized by auto loans, student loans, SMEs loans guaranteed by the Small Business Administration (SBA)[75], through the lowering of the costs and the increase in the accessibility to new credit. For this purpose, the FED earmarks a sum of $ 200 billion for the loans to the investors of newly originated securities with one-year maturity, then stretched to three-year maturity. Even the set of eligible collaterals has been extended many times during the lifetime of this operation, completed in June 30th 2010 and repaid in full by the end of 2014. The evidence shows a strong positive impact on the issuance of the CMBS eligible for the TALF program and, more extensively, on the spreads of the core ABS classes, which have settled back to the pre-crisis levels[76].

After the institution of the "*other lending facilities*", three more QE operations follow in order to accommodate the financial market conditions:

[71] This word refers to all the ABSs issued before 2009
[72] Source: https://www.federalreserve.gov/newsevents/pressreleases/monetary20090203a.htm
[73] Source: https://www.federalreserve.gov/newsevents/pressreleases/monetary20081125a.htm
[74] The Troubled Assets Relief Program TARP is a broad program started in 2008 and promoted in the Emergency Economic Stabilization Act with the purpose of freeing the institutions of their toxic loans for an established amount of $ 700 billion, then reduced with the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010
[75] The SBA is an independent agency of the US government that protects the interests of small businesses and ensures that they receive a fair share of government contracts
[76] AGARWAL, BARRETT, CUN, DE NARDI, 2010

- The QE2 operation within which almost $ 600 billion of securities are bought until 2011;
- The QE3 operation announced in September 2012 that promotes the open-ended purchase of MBS secured by the agencies for an amount of $ 40 billion per month (increased to $ 85 billion after few months). The buying stops in October 2014, totalizing a purchase of more than $ 4 trillion;
- The QE4 operation which begins in January 2013 with a monthly purchase of $ 85 billion of financial assets, progressively tapers during 2014 until its end in October 2014, aimed to reduce unemployment and increase the inflation rate. The securities bought are mainly Treasury Securities with 10-year maturity and MBSs, for a total holding of $ 4.482 trillion.[77]

In June 2017, the FED has announced a reduction in its holdings, with the aim of gradually sterilizing[78] the operations for an amount of $30 million per month, starting from October[79].

Along with the specific interventions made by the FED, on June 21st 2010 the Congress approves the "Dodd-Frank Wall Street Reform and Consumer Protection Act", a huge reform made in response to the financial crisis whose goal is to create a more stable and transparent environment in which the institutions and the investors can operate in a safer way.

The act principally touches eight themes, which are:

- The problem of the "*too big to fail*"[80] institutions, for which it is requested a special supervision of the Financial Stability Oversight Council (FSOC) and more stringent reserve requirements;
- The set-up of the Volcker Rule (Section 619), effective from April 2014, which forbids the banks to use hedge funds and depositors' funds for

[77] Source: https://www.federalreserve.gov/newsevents/pressreleases/monetary20141029a.htm
[78] The sterilization is an operation with which the central banks absorbs the liquidity in excess present in the financial system, neutralizing the imbalance effects
[79] Source: https://www.wsj.com/articles/fed-unveils-plans-to-shrink-balance-sheet-1497464483
[80] Expression coined during the crisis to indicate those financial entities whose failure, because of their huge dimension, would generate a profound instability of the economic system forcing the government to rescue them at any cost to prevent the disruption of the worldwide economy

proprietary trading (no longer allowed), and restricts the possibility of speculative trading;

- The institution of a clearinghouse in order to identify excessive risky operations of derivatives and a greater transparency;
- The registration of all the hedge funds with the SEC[81], in order to deliver data on their portfolios and trading operations to be assessed and controlled;
- The creation of an Office of Credit Ratings (OCR) that regulates and watches over the conduct of the CRAs, and assists the SEC in the review of their methodologies;
- The establishment of the Consumer Financial Protection Bureau (CFPB), a new agency created with the purpose of "*enforcing federal consumer financial laws and protecting consumers in the financial marketplace*"[82]. In practice, it oversees consumer loans, credit and debit cards, the levels of fees applied in mortgage and credit underwritings and protects the borrowers controlling the risk exposure they are facing and monitoring that the due diligence of the institutions is done properly;
- The formation of a new Treasury's Federal Insurance Office (FIO), vested with the authority to supervise the insurance companies and gather data on the sector;
- A reform of the FED, which empowers the existing Government Accountability Office (GAO) of the banking sector surveillance and the review of eventual emergency loans. Additionally, another agency is constituted (the Office of Financial Research or OFR) to provide high-quality financial data and help the FSOC in its duties.

In the ABS sector, this reform has translated into seven proposed rulemaking provisions, and the SEC has approved only six of them (Sections 941 – 945).[83] They relate to the credit risk retention, the ABS disclosure, representations and warranties, and due diligence.

[81] The US Securities and Exchange Commission (SEC) regulates the securities markets and facilitates capital formation. It also promotes economy growth and job creation
[82] Source: https://www.consumerfinance.gov/about-us/the-bureau/
[83] Source: https://www.sec.gov/spotlight/dodd-frank.shtml#

Three are the main rules that have an impact on the ABS market.

The Volcker Rule, implemented in 2013, prohibits the banking institutions to acquire and retain an ownership interest or some other relationships, such as proprietary trading, with hedge funds, private funds and in particular "*covered funds*", some exception being made (e.g. the "Permitted seeding and *De Minimis* Investments" rule[84]). Since in the provided definition of covered funds many ABCP conduits fall into this classification (even if there are some specific exemptions for particular issuers of ABSs), and the banks very often detain what is defined as an ownership interest, this rule directly affects the quantity of ABSs that can be held by the banking entities. For example, the aggregate value of all ownership interests of the entity and its affiliates, in all covered funds acquired or retained under the seeding and *de minimis* investment exemption, cannot exceed the 3% of Tier 1 capital[85] of the banking entity, calculated as of the last date of each calendar quarter.

Another example of provision that directly affects the ABS market is the change in the Commodity Exchange Act (CEA)[86], which establishes that a fund, a SPV, trust or similar arrangement that enters into one or more swaps can be defined as a "commodity pool". The major implication of this rule is that each commodity pool CPO[87] and CTA[88] must be registered with the CFTC and satisfy the specific standard imposed. Moreover, the commodity pools are caught in the definition of covered fund, therefore, also the limits imposed by the aforementioned Volcker Rule.

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[84] This rule allows the acquisition and the retention of an ownership interest in a covered fund "for the purposes of establishing the fund and providing the fund with sufficient initial equity for investment to permit the fund to attract unaffiliated investors, or for purposes of making a *de minimis* investment in the fund"
Source:
https://www.morganlewis.com/~/media/files/handouts/volcker_rule_and_structured_transactions_handout.ashx

[85] "Tier 1 capital, used to describe the capital adequacy of a bank, is core capital that includes equity capital and disclosed reserves. Equity capital is inclusive of instruments that cannot be redeemed at the option of the holder". In US as in EU the capital ratio is equal to the 6% of the total risk exposure, where the 4.5% must be composed of Common Equity Tier 1 (highest quality part of capital formed of common shares, retained earnings and other reserves)
Source: https://www.investopedia.com/terms/t/tier1capital.asp

[86] "The Commodity Exchange Act (CEA) regulates the trading of commodity futures in the United States. Passed in 1936, it has been amended several times since then. The CEA establishes the statutory framework under which the CFTC operates"
Source: http://www.cftc.gov/LawRegulation/CommodityExchangeAct/index.htm

[87] A CPO is an entity engaged by the commodity pool with the purpose of receiving from other entities funds, securities or properties to be traded in commodity interests

[88] A CTA is an entity that in exchange for a compensation advises, issues analyses and reports concerning the commodity interests

Qualified Residential Mortgages (QRM) rule, effective from January 2014, aims to contrast the lax lending standards experienced during the financial crisis. Already targeted by the Truth in Lending Act (TILA)[89] of 2008, the QRM rule defines some specific elements to be considered in order to assess the compliance of the mortgages in the category of "qualified mortgages" (the ability-to-repay determinations, presumption for QM, general requirements for QM, rural balloon-payment QM, other additional provisions).[90] These QRMs, characterized by a lower risk of default, are not subjected to the general risk retention rule that provides a retention rate of 5% of the credit risk of assets securitized for the issuers of ABSs: this is an attempt to restore a healthy and liquid private-label MBS market.

Recently, in the summer of 2017, there has been a proposal to modify the Dodd-Frank Act promoted by the President Trump, based on the idea that it imposes too stringent lending conditions to the banks concerning SMEs loans, but it is still object of debate among the political figures.[91] Surely, the reform has raised compliance costs for small banks but, on the other hand, it has constructed a healthier market structure; moreover, there are many other factors that have to be accounted for in the analysis of the decrease in the SMEs loans level post crisis, such as lower and lower interest rates.

The tradeoff between the prevention of the development of a new crisis and the protection of the profit-making ability of the banks and competitiveness of the markets is something that needs to be constantly pondered with accuracy.

### *2.2.2 Regulatory measures adopted in EU*

In the European Union, the development of the financial crisis follows a different course. At first, the burst of the US housing bubble does not seem to affect so much the European banks and institutions, which had not been deeply involved in the ABSs investments, especially the worse quality ones. Nevertheless, from 2008 a progressive lack of trusts spreads overseas too, and progressively starts to highlight all the preexistent

[89] The TILA is a US law aimed to promote the informed use of consumer credit, requiring higher levels of disclosure regarding terms, costs for the borrowers. It also includes some provisions about the regulation of credit cards and the resolution of credit billing disputes

[90] Source: http://files.consumerfinance.gov/f/201301_cfpb_ability-to-repay-summary.pdf

[91] Source: https://www.wsj.com/articles/trump-administration-proposes-wide-ranging-changes-to-financial-sector-regula tions-1497304932

structural limits of the Union, majorly caused by the harsh differences among the State Members.

The regulatory initiatives that have affected the ABSs from 2007 on are numerous, and they try to improve all the shortages enlightened by the crisis, such as liquidity, capital and leverage requirements of the institutions, due diligence from investors, governance, credit rating agencies.

Going into more detail, the European Central Bank (ECB) reacts to the crisis of the Eurozone implementing a series of unconventional policies, i.e. extraordinary measures to answer the market needs.

The first program to be executed in 2008 is the "enhanced credit support program", that provides the cut of interest rates on the refinancing operations and some Fixed Rate Full Allotment (FRFA) tender procedures. These operations are auctions in which the ECB lends to the ordinary banks an "unlimited" quantity of money at fixed preferential rates in exchange of a broadened list of collaterals that starts comprehending ABSs securities.

Unfortunately, these interventions are not enough to quiet the turbulence, which becomes much worse from May 2010 with the explosion of the public debt crisis of some European countries, i.e. Greece, Ireland, Portugal, then Italy and Spain (often denominated as the five PIIGS). The weakening of the interbank market solidity also contaminates the stronger countries, amplifying the sovereign-bank crisis.

With the announcement of December 8th 2011 the ECB reveals four initiatives: [92]

- The conduction of two Very Long Term Refinancing Operations (VLTRO), which are FRFA auctions with an extended temporal horizon of three years with the option to early repay the loan one year later;
- The temporary interruption of the "*fine tuning*" operations[93];
- The reduction of mandatory reserve ratio coefficient of the banks from 2012;
- The new enlargement of the list of eligible collaterals in the tender procedures, through:

[92] Source: https://www.ecb.europa.eu/press/pr/date/2011/html/pr111208_1.en.html
[93] A fine tuning operation is "a non-regular open market operation executed by the Eurosystem mainly in order to deal with unexpected liquidity fluctuations in the market"
Source: https://stats.oecd.org/glossary/detail.asp?ID=6784

- The reduction of the necessary rating threshold for some classes of ABSs (i.e. with a second-best rating of at least "single A" in the Eurosystem harmonized credit scale);
- The allowance of the national central banks to accept as collateral also ABSs backed by performing loans, such as interbank loans, SMEs loans and residential mortgages satisfying particular conditions. For example, the pool must be homogeneous, all the other eligibility criteria must be fulfilled, and servicing continuity provisions must be satisfied.

Once again, the initiatives undertaken by the ECB do not result sufficient to contrast the aggravation of the EU crisis. At the beginning of 2014, the new enemy to face is deflation: Bulgaria, Greece, Cyprus, Portugal, Sweden, Slovakia, Spain and Croatia register a decrease in the general level of prices, but also other countries register negative variation of the European Harmonized Consumer Price Index (HICP Europe), that will reach its maximum negative peak in January 2015.

In this regard, the President of ECB Mario Draghi, announces in a press release on June 5th 2014[94], new policies addressed to fight the stagnation of the economy, part of the so called "*big bazooka plan*". Along with the lowering of the interest rates on the refinancing operations, the turn of the deposit rate to negative, and the promotion of the new Targeted Long Term Refinancing Operations (TLTRO), the ECB decides to accelerate the setup of the new purchase program of ABSs (ABSPP) that officially starts on November 2014 both on the primary and secondary markets[95]. The ultimate aim of this measure, under the extended asset purchase programme (APP)[96], is to stimulate the banking sector to grant credit lines to the real economy easing the credit conditions. The program widens again the eligibility criteria of the ABSs purchased in terms of credit ratings required, that is now lowered to CQS3 (BBB-/Baa3/BBBI).

The APP purchases are recalibrated few times to pursue price stability[97].

[94] Source: https://europeancentralbank.wordpress.com/2014/06/05/conferenza-stampa-5-giugno-2014/
[95] Source: https://www.ecb.europa.eu/ecb/legal/pdf/en_ecb_2014_45_f_sign.pdf?e692214479b20df3c42b0d5d3c11783f
[96] The APP purchases also comprehend covered bonds (CBPPP3), public sector securities (PSPP) and corporate securities (CSPP) of the Eurozone responding to certain eligibility criteria
[97] Source: https://www.ecb.europa.eu/pub/economic-bulletin/html/eb201707.en.html#IDofBox2

In January 2015, the ECB expands the amount of purchases to € 60 billion per month and extends the length of the purchases until March 2016; then, in April 2016, the purchases are increased to € 80 billion per month scheduled until March 2017; in December 2016, the Governing Council prolongs the net purchases until December 2017 but reduces the monthly pace to € 60 billion again.

Finally, last October the ECB has decided to further decrease the buying to € 30 billion per month from January 2018 and to stop them in September 2018. The holdings of ABSs in October 2017 were equal to € 24,682 million.

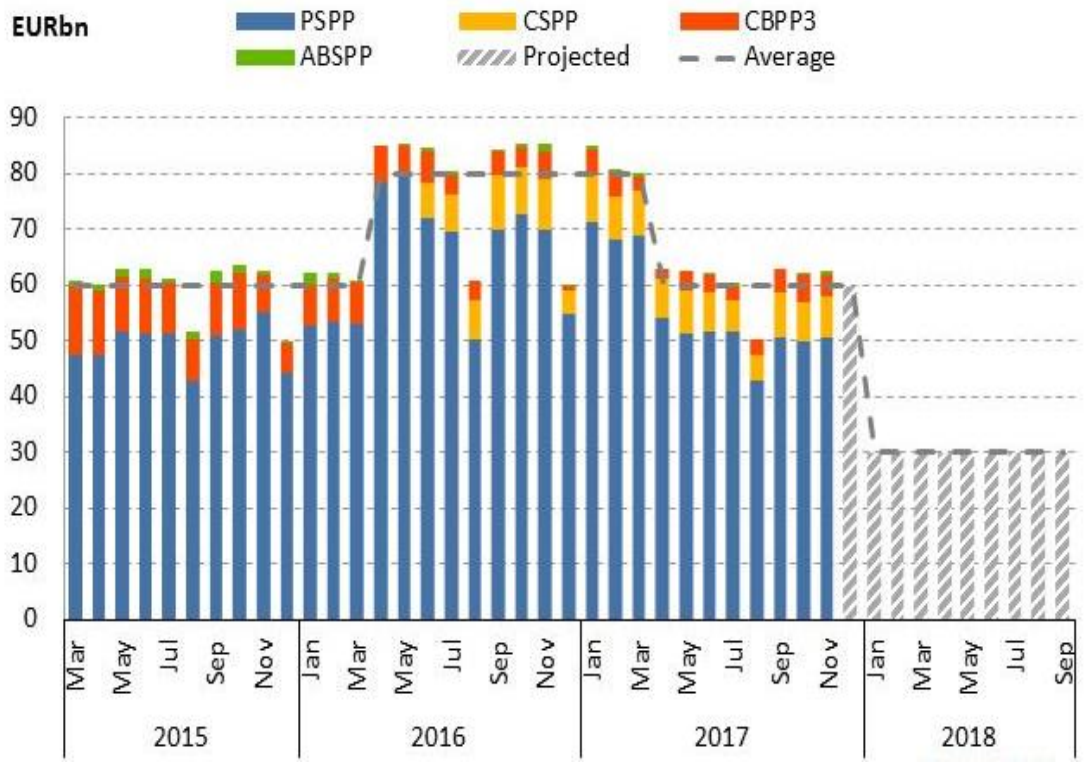


**Figure 5. APP monthly net purchases and projections**
**Source: ECB, 2017**

Contemporarily to these operations of monetary policy, the European regulators have carried out many reforms that affect the ABS market and securitization in general.[98]

The purpose of all these proposals, coming from the joint forces of the Basel Committee on Banking Supervision (BCSB)[99], the International Organisation of

[98] BOE, ECB, 2014

[99] "The Bank for International Settlements (BIS) is an international financial organization owned by 60 member central banks, representing countries from around the world […] The mission of the BIS is to serve central banks in their pursuit of monetary and financial stability, to foster international cooperation in those areas and to act as a bank for central banks"

Securities Commission (IOSCO)[100] and the European Commission, is to form an EU a "*STS securitization*" framework: simple, transparent and standardized.[101]

Simplicity relates to the homogeneity of the underlying assets not excessively structured; transparency focuses on the provision of sufficient information on the underlying pool, the transaction structure and the parties involved in order to let the investors assess the relative risks; comparability promotes the use of criteria and guidelines that improve the comparison across the different securitized instruments belonging to the same class.

A specific Task Force on Securitisation Market (TSFM) develops the criteria since 2014, and it deals with the design and implementation of these rules. At the current date, there are 17 standards in place subdivided in order to manage the asset, structural and fiduciary or servicer risks. If the instruments held by the banks satisfy the conditions required to be considered as a STS securitized product, they will benefit of differentiated regulatory capital treatment (scaled risk weights and senior risk weight floor of 10%), applied by the banks but supervised by the national authorities.

As already mentioned, the financial crisis has brought to light some deficiencies in the securitization process, allowed by the inefficient regulatory framework at the time, firstly published in June 2004: Basel II.

The major shortcomings of the old rule system have been proved to be:

- The overreliance on external credit ratings, since the banks had to use the Ratings-Based Approach (RBA) whenever securitization exposures were externally rated or a rating was deducible;
- Wrong risk weights, since the capital requirements for highly-rated securitized products have been proved to be too low (because of the erroneous assumptions of low correlation of losses, the non-accounting for the thickness of the tranches, the incorrect valuation of the potential extreme losses) and the capital requirements for low-rated securitized products have been instead too

Source: https://www.bis.org/about/index.htm?m=1%7C1

[100] "IOSCO is the international body that brings together the world's securities regulators and is recognized as the global standard setter for the securities sector. It develops, implements and promotes adherence to internationally recognized standards for securities regulation"
Source: https://www.iosco.org/about/?subsection=about_iosco

[101] BCBS, 2017, July

penalizing with respect to the actual losses reported, that incentivized to more leveraged exposures. This last effect is due to the reduction in the subordination protection of the senior tranches, since the issuance of junior tranches is lower;

- Cliff effects in capital requirements since, as a consequence of the previous point, they increased too rapidly among different rated securitized instruments and changed too much in absolute values, amplifying the magnitude of the downgrades.

To overcome these issues and integrate the STS criteria into a less vulnerable legislative framework, after the financial crisis there have been many modifications, the so-called "Revisions to the Basel Securitisation Framework". At last, they have converged into the Basel III Reforms, a project announced in 2010 and finalized in December 2017 but not yet fully implemented. Here an updated summary of the transitional arrangements and the implementation dates of the new regulation main standards:[102]

| Revision | Implementation date |
|---|---|
| Revised standardised approach for credit risk | • 1 January 2022 |
| Revised IRB framework | • 1 January 2022 |
| Revised CVA framework | • 1 January 2022 |
| Revised operational risk framework | • 1 January 2022 |
| Revised market risk framework | • 1 January 2022[6] |
| Leverage ratio | • Existing exposure definition:[7] 1 January 2018<br>• Revised exposure definition: 1 January 2022<br>• G-SIB buffer: 1 January 2022 |
| Output floor | • 1 January 2022: 50%<br>• 1 January 2023: 55%<br>• 1 January 2024: 60%<br>• 1 January 2025: 65%<br>• 1 January 2026: 70%<br>• 1 January 2027: 72.5% |

[6] This will constitute both the implementation and regulatory reporting date for the revised market risk framework published in January 2016.

[7] Based on the January 2014 definition of the leverage ratio exposure measure. Jurisdictions are free to apply the revised definition of the exposure measure before 1 January 2022.

**Figure 6. Transitional arrangements of Basel III**
**Source: BCBS, 2017, December (2)**

[102] BCBS, 2017, December (1)

In EU the reform has been implemented transposed into law with the regulation CRD IV /CRR of 2013 on capital requirements for banks, Solvency II directive for insurance undertakings of 2009 (then implemented in 2015 and applicable from 2016) and the Framework for a STS securitization of 2015. Furthermore, the EU regulators have updated in 2013 the CRA regulation.

The main features characterizing the Basel III program are the following:

- Increase the level and the quality of the capital to cover for the unexpected losses, raising the Minimum Tier 1 capital;
- Enhance the capital requirements, with the Credit Valuation Adjustment (CVA)[103] risk;
- Constrain the bank leverage reducing their risks, introducing a leverage ratio[104] threshold;
- Improve the bank liquidity, through the Liquidity Coverage Ratio (LCR)[105] and the Net Stable Funding Ratio (NSFR)[106];
- Limit the procyclicality through the construction of stronger countercyclical capital buffers (CCyB)[107].

[103] The CVA is a measure that can be calculated following different methodologies. It can be expressed as the difference between the risk free portfolio value and the real portfolio value, that takes into account the possibility of default (Debt Value Adjustment or DVA)

[104] The leverage ratio is the ratio between the Tier 1 and the net exposures of the institution (on and off the balance sheet). It should be greater or equal than 3%. The aim is to limit the leverage that a bank should take. For Global Systemically Important Banks (G-SIBs) it is provided a further buffer to be added to the leverage ratio

[105] The LCR promotes the short-term resilience of the liquidity risk profile of banks by ensuring that they have sufficient high quality liquidity assets (HQLA) to survive a significant stress scenario lasting 30 days

[106] The NSFR is defined as the ratio between the available amount of stable funding and the required amount of stable funding. This ratio must be at least equal to 100%

[107] The CCyB is calculated as weighted average of the buffers in effect in the jurisdictions to which banks have a credit exposure and extends the capital conservation buffer. It is implemented at a national level e should vary in a range comprehended between 0 and 2.5%

| | 2015 | 2016 | 2017 | 2018 | As of 2019 |
|---|---|---|---|---|---|
| Leverage ratio | Parallel run until 1 Jan 2017 Disclosure started 1 Jan 2015 | | | Migration to Pillar 1 | |
| Minimum CET1 ratio | 4.5% | 4.5% | 4.5% | 4.5% | 4.5% |
| Capital conservation buffer | | 0.625% | 1.25% | 1.875% | 2.50% |
| G-SIB surcharge | | Phase-in | | | 1.0%–2.5% |
| Minimum common equity plus capital conservation buffer | 4.5% | 5.125% | 5.75% | 6.375% | 7.0% |
| Phase-in of deductions from CET1 (including amounts exceeding the limit for DTAs, MSRs and financials) | 40% | 60% | 80% | 100% | 100% |
| Minimum Tier 1 capital | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% |
| Minimum total capital | 8.0% | 8.0% | 8.0% | 8.0% | 8.0% |
| Minimum total capital plus capital conservation buffer | 8.0% | 8.625% | 9.25% | 9.875% | 10.5% |
| Capital instruments that no longer qualify as Tier 1 capital or Tier 2 capital | Phased out over 10 year horizon beginning 2013 | | | | |
| Liquidity coverage ratio | 60% | 70% | 80% | 90% | 100% |
| Net stable funding ratio | | | | Introduce minimum standard | |

| | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|
| Revisions to the standardised and internal ratings-based approaches to credit risk | Introduce | | | | | |
| Revised CVA and market risk frameworks | Introduce | | | | | |
| Revised operational risk framework | Introduce | | | | | |
| Output floor | 50% | 55% | 60% | 65% | 70% | 72.5% |
| | Increase in RWA subject to 25% cap at national discretion. | | | | | |
| Leverage ratio exposure measure and G-SIB surcharge | Introduce | | | | | |

**Figure 7. Phase-in arrangements of Basel III**
**Source: BCBS, 2017, December (1)**

The major structural changes that reflect on the securitization segment are now explained specifically.

In Basel II Framework, there existed two hierarchies used for the credit risk measurement: the Standardised Approach (SA), utilized by less sophisticated banks that only accounts for a limited number of elements (e.g. the role of the bank in the process, credit enhancement); the Internal Ratings-Based Approach (IRB), used by more structured realities to assess in detail their risk exposures.

With Basel III, the BCBS reviews the hierarchy, in order to uniform the method used and to have a system that less relies on the external ratings.[108]

[108] BCBS, 2016

The Securitisation Internal Ratings-Based Approach (SEC-IRBA) is the first step in the ladder: it uses the Simplified Supervisory Formula Approach (SSFA)[109] in combination with the capital charges provided by the old IRB method, to take into account for the thickness of the tranche and its maturity and eliminate the cliff effect. The final formula used to measure the risk weights is:

$$RW = \left[\left(\frac{K_{IRB} - A}{D - A}\right)(12.5)\right] + \left[\left(\frac{D - K_{IRB}}{D - A}\right)(12.5)\left(K_{SSFA(K_{IRB})}\right)\right]$$

where D and A are respectively the detachment and the attachment points, $K_{SSFA}$ is calculated with the aforementioned SSFA formula, $K_{IRB}$ is the capital charge of the IRB method and $K_{SSFA(K_{IRB})}$ is the capital requirement per unit of securitization exposure under the SEC-IRBA calculated with a specific formula. The floor provided for the risk weights is 15%. These capital charges are higher than the ones in place with Basel II and can make uneconomical for many institutions to hold securitized assets. CRD and Solvency II both require lower capital charges and risk weights for the other assets, in particular covered bonds.

If the capital charges are not available for the specific securitization exposure (i.e. the tranches are not rated for some external reason), then a second method must be used: the Securitisation External Ratings-Based Approach (SEC-ERBA), if the national regulators allows to use external ratings for regulatory purposes. With respect to the past, other risk drivers are considered about the thickness and the maturity of the tranches for non-senior exposure, reducing the risk weights for longer-maturity tranches in order to contrast overstating issues. The aim is to not rely too much on the external ratings as it happened in the RBA approach of Basel II.

If even this method cannot be applied, a third method is provided: the Securitisation Standardised Approach (SEC-SA). This is a more conservative approach that uses the Standardised Approach for assessing the capital charge for credit risk.

Broadly, this hierarchy offers a more prudent and sensitive framework for the securitized products, both for senior securitizations (for which the risk weight floor

[109] SSFA is a method to determine the risk weight for a securitization exposure that takes into account: the average of the total capital requirement of the underlying assets weighted for the unpaid principal of each exposure; the ratio of the sum of the dollar amounts of any underlying exposure of the securitization that meets some specific criteria; the attachment point for the exposure; the detachment point for exposure; the loss given default (LGD) and the exposure at default (EAD)

threshold is 15%) and non-senior ones, but in comparison with other asset classes such as covered bonds is maybe too penalizing.

Even LCR provides a more generous treatment for covered bonds vis-à-vis to securitized products with similar characteristics in terms of risks. It is enough to think that, under the provisions envisaged for the qualification of the assets as HQLA, the haircut required for covered bonds is 10%, while the one for RMBSs is 25% and they have to specifically meet certain conditions, i.e. the LTV lower or equal than 80%, the full recourse for all the mortgages and the compliance to the "risk retention" rules.[110]

Similarly, the NSFR available amount of stable funding, covered bonds rated at least AA- receive a 15% RSF factor[111], while RMBS have an assigned RSF factor that varies between 50% and 65% depending on their features.[112]

In the context of Basel III reforms, in April 2014 the "Supervisory framework for measuring and controlling large exposures" has been revised too.[113] The rationale behind this review, that will start to be implemented from January 2019, is to target and limit the large control exposures[114] to single counterparties or groups of connected counterparties that could lead (and have led during the crisis) to huge losses in the financial institutions. The securitization market will be influenced by the reform in the identification of additional risk matter, which is the recognition of the risks associated to a certain structure, more than to an underlying asset. For this reason the ABCP conduits, SPVs, or CDSs sellers themselves are considered as additional factors of risk of the exposure value (i.e. the amount invested), therefore reducing their appeal to the financial institutions.

The implementation of the adequacy measures for the insurance entities is left, at the EU level, to the Solvency II directive under the guidance of EIOPA. The main purposes of the three pillars are: the creation of a single supervisory regime for the EU insurance sector, the more efficient management of the risks taken, improved consumers'

[110] Source: https://www.bis.org/publ/bcbs238.pdf
[111] The Required Stable Funding (RSF) factor approximates the amount of that class of asset that should be founded, either because it will be rolled over, or because it could not be monetized through sale or used as collateral in a secured borrowing transaction over the course of one year without facing significant expense. This is the amount that should be supported by stable funding
[112] Source: https://www.bis.org/bcbs/publ/d295.pdf
[113] Source: https://www.bis.org/publ/bcbs283.pdf
[114] An exposure is defined large if it is equal or above 10% of the bank's eligible capital base

protection, enhanced reporting to anticipate the eventual problems.[115] The main issue regarding this regulation concerns the extremely high capital charges even for high-quality securitization, namely STS securitization, to such an extent that insurance companies have almost entirely abandoned the securitization market.[116]

The reform provides three different types of securitization classes:

- Type 1, which includes the highest quality ABS such as senior tranches, investment grade rated assets, true-sale transactions, ABS whose pool is composed of prime and performing mortgages, MSE loans, prime auto and consumer loans;
- Type 2, that includes all the asset classes of lower quality that are not comprehended in the previous category such as junior tranches of CLOs and CMBSs;
- Resecuritizations, whose underlying pool includes other securitizations (ABS CDOs, and ABS CDSs).

The table reported below shows the capital charges required for the different categories of securitized assets, comparing them with the ones for covered bonds and corporate bonds. Note that the risk factors must be multiplied by the modified spread duration[117] of the ABS to obtain the capital charge:

| Rating Category<br>Credit Quality Step | AAA<br>0 | AA<br>1 | A<br>2 | BBB<br>3 | BB<br>4 | B and below<br>5 & 6 |
|---|---|---|---|---|---|---|
| Type 1 Securitisation | 2.1% | 3% | 3% | 3% | N/A | N/A |
| Covered Bonds | 0.7% | 0.9% | N/A | N/A | N/A | N/A |
| Type 2 Securitisation | 12.5% | 13.4% | 16.6% | 19.7% | 82% | 100% |
| Corporate Bonds | 0.9% | 1.1% | 1.4% | 2.5% | 4.5% | 7.5% |
| Re-securitisations | 33% | 40% | 51% | 91% | 100% | 100% |

**Figure 8. Capital requirements in Solvency II**
**Source: Vontobel, 2017**

[115] Source: https://eiopa.europa.eu/pages/supervision/insurance/solvency-ii-going-live.aspx
[116] Source: https://www.reuters.com/article/abs-regulations/securitisation-needs-solvency-ii-game-changer-idUSL5N1F M5KN?feedType=RSS&feedName=financialsSector
[117] The modified spread duration measures the change in the price of a security due to the movements in the spread of that specific asset and it has a floor of 1

In 2019, there will be amendments to Solvency II, which presumably will lead to: a reduction in the capital charges for what concerns STS securitizations, that will broaden the Type 1 category; reduction in weights, that will become more aligned with covered and corporate bonds. Hopefully, these implementing measures will revitalize the insurance entities activity in the ABS market.

Lastly, other specific provisions regard the CRAs, which are more bounded by stricter conduct rules, after the turmoil they have been experienced during the crisis. The regulatory framework tries to contrast the over-reliance on external credit ratings and the conflict of interest issues, enhance the transparency of ratings, and assign more responsibility to the CRAs for the ratings they give. In particular, CRA III introduces new important rules such as: specific improved requirements to be registered with the EU as CRAs; new provisions related to the conduct of business (i.e. transparency rules, conflict of interest, rating methodologies, and so on); implemented supervisory authority of ESMA.

In the scope of securitization process, the major news relate to:[118]

- The obligation of the issuer to appoint at least two independent CRAs to solicit a credit rating for a structured finance product (increasing in some cases the transaction costs), and one of them should be a "small CRA", i.e. an entity that holds no more than 10% of the total market share;
- The "Joint Disclosure Requirements" that obliges the issuer, the originator and sponsor involved in the securitization process to publish certain information about the operations, among which the performance of the underlying assets, the cash flows, the structure of the transaction, the collaterals pledged and any other information that can help investors to assess the creditworthiness of the product in question defined in specific Regulatory Technical Standards (RTS);
- The definition of the "maximum rating period" in the resecuritization processes, meaning that a CRA cannot issue ratings for resecuritized instruments for more than four consecutive years and it cannot enter again into a contract with the same counterparty for a period equal to the length of the

[118] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-supervision-and-risk-manage nt/managing-risks-banks-and-financial-institutions/regulating-credit-rating-agencies_en

expired contract. Some exclusions are provided, e.g. exemptions for CRAs that do not overstep some specific dimension thresholds or the "multiple rating agencies exemption". If on one side this limits the arising of the conflict of interest deriving from long lasting relations between the issuer and the CRA, on the other hand the rotation mechanism increases costs for both the counterparties.

### 2.3 Impediments of the regulation to the correct functioning of the ABS market

In the actual context of macroeconomic downturn and low growth, especially in the Eurozone, the markets are experiencing a slow recovery after the financial crisis stroke the economic system. In these circumstances, the degree of investors' trust in the future solvency of the assets composing the underlying pools of ABSs decreases ever more. This phenomenon is accentuated by the fact that ABS instruments are usually traded in OTC markets, therefore even in normal times, they are characterized by a lower level of liquidity.

In order to exploit the advantages of the securitization, regulation should try to alleviate the distress of the ABS market, by promoting the issuance and the tradability of these financial assets.

However, from the overview just delivered, it is clear that regulators prefer a more conservative approach to avoid a new misapplication of these powerful tools. Following this path means creating regulatory constraints that alter the well-functioning of the market, impinging on both investors and issuers involved in the securitization.[119]

On the side of the investors, the higher capital requirements provided are a deterrent for investing in this kind of securities, since the investment costs associated to them increase, especially for small businesses and insurance companies, which have to comply with Solvency II. Moreover, the calculation of many capital buffers rejects the inclusion of the ABS instruments, causing the inconvenience for the financial institutions to hold them in the portfolios with respect to other classes of assets which give the opportunity of a long-term financing (covered and corporate bonds mainly).

[119] BOE, ECB, 2014

The lack of harmonization among the rules implementation is another factor to be considered. The risk retention requirements are inconsistently put in force across the diverse jurisdiction and this causes the stoppage of free investment flows, since they try to exploit these variations by investing just in the most convenient country from a regulatory point of view.

The last, but not the least aspect to be analyzed is the impact of the investors' expectations. In a period of regulatory uncertainty in which many times a year the government entities make proposals, tunings and introduce technical standards to better adjust the existing framework to the needs of the markets, the investors may have some difficulty to believe in the solidity of the ABS market in the long run. In many cases, the too prudent behavior and distrust of the investors affects the secondary market liquidity more than the regulation in place. This issue also reflects on the behavior of the asset managers that do not propose this kind of product to their clients, which might perceive these instruments as too risky assets, a belief amplified by the fragmentation in terms of jurisdiction but also of legal framework, trading venues, data analyses.

Even on the issuers' side, the uncertainty linked to the continuous development of the regulatory background is an element that negatively influences their willingness to hold the ABSs in their portfolios, and the too punitive capital charges applied amplify this trend.

The wiser conduct of the CRAs taken in consequence to the crisis leads to an important increase in costs for the issuers, who must provide higher levels of credit enhancement to obtain acceptable ratings, which in many cases cannot achieve triple-A, thus reducing the investors' base. With respect to the past, the rotation of the CRAs in the resecuritization has increased infrastructural costs for the issuers. If the transaction costs become too high in comparison with the main benefits that brings securitization (i.e. risk transfer and capital availability), the issuers can and do consider other forms of funding conditions, offered both in the private and public sectors.

# CHAPTER 3
# MEASURING THE IMPACT OF THE REGULATORY MEASURES ON THE SECURITIZATION MARKET

## 3.0 Purpose of the chapter

The third chapter of the thesis wants to focus on the measurement of the regulations effect on the securitization market of the European Union.

Estimating the impact of the regulation without confusing it with the effect of other external factors on the economy is not a trivial task, and it strongly varies with the type of regulations under discussion and the time period being considered.

Therefore, many authors have explored models to efficiently account for all these dynamics and isolate the "true" impact of regulatory measures; nevertheless, the solution is not straightforward.

The first section provides a general introduction on the ways in which the regulation effects can be estimated and which are the methods that can be applied to better achieve this task with a brief introduction to the multiple regression analysis that will be the method chosen to conduct the estimation. The second part outlines a general idea of which are the paths followed by the main studies on the impact of regulation on the economy in the latest years.

The core section of the chapter is the last one, in which there is the explanation of the quantitative study directed to estimate how much the regulatory measures of the Dodd-Frank Act and Basel III have influenced the market of the ABS instruments in the EU and US markets. After an overview of the outputs obtained running the regressions using the statistical software R[120], a brief discussion of the major findings is presented.

## 3.1 How to measure the impact of regulation

During the years, many authors have found an interest in the evaluation of policy enforcements in various sectors: competition policies (e.g. rules about mergers, market abuses, State aids and so on), transparency, quality of the countries governance are just few examples of the vastness of the fields that can be explored.

[120] https://www.r-project.org/

The aims of the evaluation of a regulation or a regulatory policy are many. First, the analysis of the effect of the regulation can lead to an improvement of the decisions taken by the regulators; secondly, the enforcement procedures can be refined in order to increase the effectiveness of the laws. Moreover, the ex-post analyses can be conducted with the purpose of informing the external parties and improve the transparency in the process, evaluate the deviations from the prefixed benchmarks (such as the benefit-cost ratio), and compare the progresses made through time.

In this way, a better management and prioritization of the public resources can be achieved, leading to positive results for the overall economy. In the latest years, an always-increasing number of governments is introducing "better regulation" initiatives, with the purpose of undertaking a regulation change only in the cases in which the net benefit is sufficiently high to bear the net costs related to it.

The first question to be answered when one approaches to the study of the regulations impact is what is that the study wants to evaluate. In fact, this term applies to many categories of estimation such as:[121]

- Regulatory administration, a type of study focused on the assessment of the efficiency in the implementation of the regulation;
- Behavioral compliance, i.e. the determination of the level of the individuals compliance to the new policies adopted;
- Outcome performance, which focuses on the "real" and final impacts of the regulation on the economy, neglecting how well the regulation has been implemented and how much the compliance is high. This represents the widest field of the regulation measurement, and the evaluation can be mainly done through the use of indicators (i.e. empirical measures or descriptive statistics) or by attribution (i.e. empirical inferences that show which has been the actual change in the indicators, analyzing the causal relationship).

[121] COGLIANESE, 2012

### *3.1.1 The use of indicators*

Once the purpose of the study has been selected, it is the case to focus on choosing the most suitable indicators to capture the effects under analysis. The target of the indicators can be different, for example, they can measure the absolute effectiveness or the cost-effectiveness, the net benefits, the distributional fairness, whenever the policy change affects groups differently, correlation analysis.

Anyway, since the impact of a regulation in general is very broad and affects many areas of the economy and the society, a single indicator might not be enough to comprehend the total effect of a regulation. Therefore, it is very common to use a set of indicators that range over the different aforementioned categories.

The static analysis of indicators provides a useful picture of the impact, but it should be contextualized in a wider analysis that takes into account the causality of the changes and a cross-sectional comparison among different countries, adjusting for the possible spillover effects[122]. In this case, there could arise the risk of free riding among countries with different regulation standards on a certain matter.

### *3.1.2 The use of the Attribution Analysis*

At this stage, a further step can be conducted in the investigation of the regulatory measures effectiveness: the attribution analysis, also denominated by the European Commission "Counterfactual Impact Evaluation" (CIE)[123]. This is a method of ex-post evaluation, used to compare the outcomes considered of a group exposed to a regulatory change or reform, called treated group, and the outcomes recorded for a similar group that has not been exposed to the treatment, i.e. the control group. This type of analysis is named counterfactual since it measures the effect of the intervention through the estimate of what the outcomes would be if there were not the intervention of the regulators.

The counterfactual analysis can be done following three different paths:

- Controlled experiments, that are not applicable in the case of the evaluation of the policy measures, since they do not happen in a supervised environment;

[122] The spillover effect is the impact that changes in other countries can have on the other ones, even if they seem unrelated

[123] Source: https://ec.europa.eu/jrc/en/research-topic/counterfactual-impact-evaluation

- Randomized experiments, that try to find the differences across the treatment and the control group between which the eventual differences should be equally distributed, and thus they should not interfere during testing. Probably, they represent the most valid tool that one can dispose of in the analysis of regulatory policies, but it is also the most difficult to be implemented both in terms of time, since they often involve iterative simulations, and costs, since they are expensive to develop;
- Observational studies, which are the most used and depend on statistical techniques in order to explain the differences that might occur between the two groups through the comparisons of data collected over time or across different jurisdictions. The important point in the analysis of the changes in regulation regards the confounding problem. In statistics, the term "confounder" refers to a factor that affects both the outcome and the independent variable whose effect is going to be estimated. This might lead to incorrect estimates of the causal effect among multiple factors; in fact, the analysis could show a correlation between the outcome chosen and the regulation change, when in reality it depends on something else. Regression discontinuity, propensity scoring and difference-in differences (DD) estimations are few examples of methods used to account for confounders and mitigate their harmful effect.

  In particular, the DD method is one of the most diffused in this area of analysis since the work of Ashenfelter and Card[124] that in 1985 applied it to measure the effectiveness of the CETA, a governmentally funded program of job placement that provided trainings to unemployed workers. This kind of investigation follows the idea that estimating the effect of the regulation on the economy can be approximated through the estimation of the difference in the variables coefficients of two different groups, one exposed to the treatment (i.e. the change in the regulation) and one which is a control group not exposed to the treatment. In order to correctly estimate the effect, the two groups considered should be quite similar, otherwise the influence of other external variables could lead do biased estimates. Unfortunately, the suitable groups for this kind of analysis are

[124] ASHENFELTER, CARD, 1985

not available in many cases, especially when it comes to the evaluation of broad international regulation policies, such as Basel III.

A simple regression study about the impact of the regulation over time can show the effects of the measures adopted, but it has to be handled with care since it could lead to erroneous considerations about the true contribution of the policy change to those effects.

Therefore, a multiple regression can be a more appropriate instrument to take in consideration different factors that can have an influence on the outcome and to give insights about the role of each of these factors in the outcome changes, assuming that the effects of the variables considered on the outcome are linear. Even if there are more sophisticated and advanced tools that can be adopted, multiple regressions can help in the analysis providing easily interpretable results through a quick implementation phase. It can be generalized as follows:

$$Y_i = \beta_0 + \beta_1 X_{i,1} + \cdots + \beta_p X_{i,p} + \varepsilon_i$$

where: $Y_i \; with \; i = 1, \dots, n$ is the outcome related to the *i-th* unit on which the effects of the policy are being estimated; $\beta$ represents all the unknown fixed regression coefficients associated to each variable taken into account in the model, with $\beta_0$ being the intercept; $X$ indicates the $p$ predictors believed to be related to the outcome variable, and ε is the random error term that accounts for the effect that the model cannot explain, and which is assumed to have a normal distribution with:

- The expected value equal to 0, $E(\varepsilon_i) = 0$;
- The variance equal to $\sigma^2$, $Var(\varepsilon_i) = \sigma^2$;
- Uncorrelation among the series of the error terms, $Cov(\varepsilon_i, \varepsilon_j) = 0 \;\; \forall i \neq j$.

The model can also be written using the matrix notation, which is:

$$\underset{n\text{x}1}{\boldsymbol{Y}} = \underset{n\text{x}(p+1)}{\boldsymbol{Z}} \; \underset{(p+1)\text{x}1}{\boldsymbol{\beta}} + \underset{n\text{x}1}{\boldsymbol{\varepsilon}}$$

Therefore, in this case the covariance of the error term becomes equal to: $Cov(\boldsymbol{\varepsilon}) = E(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}') = \sigma^2 I$. Now $\sigma^2$ is a n x n variance-covariance matrix for the random error terms and for **Y**.

Usually, in the multiple regressions used in this area, there are: the inclusion of a "*dummy*" variable[125] in the model that accounts for the point in which the regulation starts being effective; one or more variables that are included to adjust for the confounding problem, and therefore they take into account other factors, such as the general economic conditions.

The $\beta$ coefficients[126] are the measure of the change in the value of the average value of the outcome due to a change in the variable considered, all other things being constant. In other words, they estimate the partial effect of the variables on the outcome. There are plenty of ways that can be used for the estimation of the regression coefficients, but the most used approach is the method of Least Squares Estimation, a method that chooses the value of $\beta$ that minimizes the sum of squared residual defined as $(\boldsymbol{Y} - \boldsymbol{Z\beta})'(\boldsymbol{Y} - \boldsymbol{Z\beta})$.
From the performance of the minimization, it can be obtained the formula to calculate the estimates of β that is, $\widehat{\boldsymbol{\beta}} = (\boldsymbol{Z}'\boldsymbol{Z})^{-1}\boldsymbol{Z}'\boldsymbol{Y}$.

Once the regression model has been defined and the coefficients estimated, the model goodness of fit can be measured through the coefficient of determination, also denominated $R^2$, which ranges between 0 and 1, where 1 represents a tight fit of the model to the real data:

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}} = \frac{\sum_i (y_i - \hat{y}_i)^2}{\sum_i (y_i - \bar{y})^2}$$

in which $SS_{res}$ is the residual sum of squares, i.e. the sum of the squared differences between the real and the estimated outcomes, namely the error terms, and $SS_{tot}$ is the total sum of squares, which is the difference of every outcome observation from the general outcomes mean.
Since this index assumes always-higher values with the increase of the number of predictors added in the model, the risk is that too many redundant variables are included in the regression.

[125] A "dummy" variable is a factor with a binary form, which typically takes values of 1 or 0 depending on the presence of an event or factor, such as the intervention of the regulator in this kind of analyses. It can also discriminate different groups among the observations used, therefore assuming a range of values
[126] The regression coefficients can be estimated in several ways but the most common is the Ordinary Least Squares (OLS), which is an optimization method aimed to find an optimal curve that minimizes the sum of the squared residuals between the data observed and the curve that represents them. The assumption required is that: $E(\varepsilon_i|\boldsymbol{X}) = 0$

For this reason, in the multiple regression analyses, the $R^2$ index is often replaced by another measure: the Adjusted $R^2$, which takes in consideration the number of the observations *n* and the number of the regressors *p* and increases only when the newly added variable in the model explains a fraction of variance that is higher than the one expected to be explicated by chance:

$$R^2_{adj} = 1 - (1 - R^2)\frac{n-1}{n-p-1}$$

The regression model shortcomings arise when there is a very low number of data to work on, or there is a high degree of inter-correlation among the explanatory variables. For this reasons, it is particularly indicated in the comparison of outcomes across jurisdictions or over time.

### 3.2 A literature overview on the breakdown of the regulations effects on the economy

During the years, the attempts of getting quantitative estimates of the policies impacts on the economic systems have highlighted significant difficulties in achieving strong results.

From the review of the studies conducted from 2000s on, it is evident that the lack and fragmentation of available data sets, the wideness of factors to be taken in consideration and the extreme specificity of every study do not allow to reach unquestionable conclusions about the effectiveness and the improvements deriving from a certain policy change.

In most of the cases, evidence gives useful insights about what is the interaction between the economic conditions and the regulatory policy considered, but the aim of these analyses cannot and does not want to be exhaustive.

This overview concentrates on the studies that have performed multiple regression analyses, since they will be used afterwards in this work. This kind of studies has found many applications in the evaluation of two main categories of public interventions: the administrative simplification area and the enhancements of the governance.[127]

For what concerns the administrative simplification and the reduction of legislative burdens, two important studies have been conducted by using regression analyses.

[127] PARKER, KIRKPATRICK, 2012

The first study has been performed by the Australian Government Productivity Commission and dates back to 2006[128]. Its purpose is to assess the improvements of the National Reform Agenda (NRA) to reduce the overlaps among different existing regulations and to enhance the review of the regulations to endorse the best practices on a wide number of sectors and services. Comparing nine different jurisdictions using the "MMRF-NRA model" that takes into account several components about government revenues, demography, fiscal balance and taxation, the study demonstrates that the potential reduction in compliance costs would be around the 20% and, consequently, the GDP would increase of almost 1.5%.

The Swedish Agency for Growth Policy Analysis (SAGPA) has performed the second study in 2010.[129] The purpose of the study is the estimation of the negative effects of the regulations on competition, growth, compliance and technological changes on the economic growth due to the barriers created to the entrance of the firms in the market. To measure the burden on the growth of economy, the model relies on the World Bank's "*Doing Business*" indicators[130] set that covers the measurement of ten main areas of business regulations for firms in 190 economies, yield requirements, entrepreneurship, profit and production dynamics and economic growth effects are evaluated. Then, the Economic Freedom index developed by the Fraser Institute (i.e. an index that ranks 141 countries on the basis of their economic freedom) are used to test the robustness of the results achieved. The outcomes enlighten negative effects of the regulatory burdens on the economy, but some of the estimates result to be statistically insignificant.

In the analysis of the governance field instead, the major findings examine the relation between the GDP and the regulation.

In the 2004 study of Loayza et al.[131] the burden of regulation on GDP growth across many jurisdictions is evaluated. A regression model based on seven indicators that measure the impact of the regulation in different areas (e.g., fiscal burden, labor market, financial markets) on an interval between zero and one estimates the effect of regulation, which is measured through a set of six indicators, on 76 countries. The findings show an inverse

[128] AGPC, 2006
[129] SAGPA, 2010
[130] http://www.doingbusiness.org/
[131] LOYAZA, OVIEDO, SERVEN, 2004

relation between the overall regulation and the economic growth, but they also show low correlation between the increase in GDP volatility and the weighting of regulation.

Jalilian et al. in 2007[132] explore the link between regulatory quality and economic performance, using a two-phase econometric model. The first step attempts to measure any direct effect of the regulation on the economic growth using cross-section analysis on 117 countries; the second step, based on a panel data analysis through the fixed effect technique, consists of an indirect estimate of the regulation growth contribution. The reason behind this twofold approach is to compensate for the lack of data available. The data set used in the second phase comprehends cross-section and time-series data for 96 countries among the ones considered in the first phase. The two regulation indicators entered in the regression assess the regulatory quality and government effectiveness measures principally based on the World Development Indicators disclosed by the World Bank. The results achieved in the paper show a strong causal link between regulatory quality and economic growth.

The last example of the use of multiple regression analysis to prove the causal chain between regulation and economic growth is the study of 2010 performed by Jacobzone et al.[133] that searches for a relationship between regulatory management system (RMS) and governance, through the data collected in the OECD surveys, Doing Business indices and Worldwide Governance Indicators (WGI). Even in this case, a double approach is adopted with the estimation of both the fixed and the random effect. The first component of the factor analysis is the measure of the ex-ante assessment of the impact analysis performed to estimate the regulation effect, and secondly, the other dimension focuses on the stock of regulation, by taking into account the reviews and the strategies adopted after the regulatory implementation (administrative simplification, restructuring licenses, and programs undertaken for the burden reduction).

Even if the quality of the data set used is not very high, since the sample size is small and there are some holes in the time series, both the correlation and the regression analyses show that an improvement in the RMS positively influences HDP, employment and labor productivity significantly.

[132] JALILIAN, KIRKPATRICK, PARKER, 2007
[133] JACOBZONE, STEINER, PONTON, JOB, 2010

### 3.3 The empirical analysis of Basel III effects on securitization

One of the studies that offers many useful tools for the purpose of our analysis is the one conducted by the IMF in the Global Financial Stability Report of 2012[134] , which aims to consider the progress on the regulatory reform of Basel II and II.5 in order to measure their impact on the financial system.

The report assesses the effect of the progress of Basel rules, distinguishing between capital and liquidity regulation on the intermediation structures, which is estimated through several structural indicators calculated from 2003 to 2010 relating to: market-based intermediation, traditional bank-based intermediation, scale and scope. Structural indicators are generally indicated in the regression model with $s_i^t$.

Then, a Difference-in-Difference (DD) regression is applied[135]. The idea behind this econometric model is to capture the effect of the policy change by estimating the differences in the regression coefficients found between a group of countries exposed to the treatment (e.g. the regulation change), and a group of control (e.g. some countries which have not been exposed to the regulatory change).

One of the main advantages in the application of this model is that it is possible to estimate the effect β many times based on several observations of the outcome *y*. However, the major shortcoming is that the estimations, especially in some specific datasets, can vary very much with respect to the selection of the *y*, exposing the model to a possible selection bias. Furthermore, it can be tricky to find comparable control groups in certain cases, such the one of the analysis that will be implemented in this thesis, in which a worldwide reform and a very specific market segment are under discussion.

Nonetheless, the study provides interesting ideas that will enrich the following investigation. Basically, the model proposed by the IMF relies on three DD regressions, which highlight the different aspects of the Basel rules:

- $s_i^t = \beta_0 + \beta_1 D_t^{Crisis} + \beta_2 Intervention\ Index_i + \beta_3 D_t^{Crisis} Intervention\ Index_i + \beta_4 Financial\ Stress\ Index_{i.t} + \varepsilon_{i.t}$

[134] IMF, 2012
[135] ASHENFELTER, CARD, 1985

- $s_i^t = \beta_0 + \beta_1 D_t^{Crisis} + \beta_2 Basel\ Capital\ Progress\ Index_i + \beta_3 D_t^{Crisis} Basel\ Capital\ Progress\ Index_i + \beta_4 Financial\ Stress\ Index_{i.t} + \varepsilon_{i.t}$
- $s_i^t = \beta_0 + \beta_1 D_t^{Crisis} + \beta_2 Basel\ Liquidity\ Progress\ Index_i + \beta_3 D_t^{Crisis} Basel\ Liquidity\ Progress\ Index_i + \beta_4 Financial\ Stress\ Index_{i.t} + \varepsilon_{i.t}$

$D_t^{Crisis}$ is a dummy variable that accounts for the financial crisis by assuming the value of 1 for the data from 2008 on; the Intervention Index measures the magnitude of the regulatory changes within the different countries; the Basel Indices are calculated on the basis of the implementation scale given by the BCBS Progress Reports. The updated implementation status of Basel III is reported below for both EU and US, but it will not be included as an index in the regression analysis of this study since it would only assume two values (i.e. one for US and one for the member States of EU) and it would lead to redundancy issues, such as multicollinearity[136,137]:

| | | EU | US |
|---|---|---|---|
| **RISK-BASED CAPITAL** | COUNTERCYCLICAL BUFFER | 4 | 4 |
| | TLAC HOLDINGS | 2 | 1 |
| | MINIMUM CAP REQUIREMENTS FOR MARKET RISK | 2 | 1 |
| | CAP REQUIREMENTS FOR EQUITIES INVESTMENTS IN FUNDS | 2 | 1 |
| | SA-CCR | 2 | 1 |
| | SECURITISATION FRAMEWORK | 2 | 1 |
| | MARGIN REQUIREMENTS FOR NON-CENTRALLY CLEARED DERIVATIVES | 4 | 4 |

[136] Multicollinearity is an issue arising from the inclusion of one variable in the regression can be predicted by another regressor already in the model. Including two measures of the same information can lead to inaccurate estimates of the coefficients, which become too sensitive to small changes in the input data and higher standard errors

[137] BCBS, 2017, December

| | | | |
|---|---|---|---|
| | CAPITAL REQUIREMENTS FOR CCPs | 2 | 1 |
| **LIQUIDITY STANDARDS** | NET STABLE FUNDING RATIO (NSFR) | 2 | 2 |
| | MONITORING TOOLS FOR INTRADAY LIQUIDITY MANAGEMENT | 4 | 1 |
| **SIB** | G-SIB REQUIREMENTS | 4 | 4 |
| | D-SIB REQUIREMENTS | 4 | N/A |
| **LEVERAGE RATIO** | LEVERAGE RATIO | 3 | 4 |
| **LARGE EXPOSURES FRAMEWORK** | LARGE EXPOSURES FRAMEWORK | 2 | 2 |
| **INTEREST RATE RISK IN THE BANKING BOOK** | INTEREST RATE RISK IN THE BANKING BOOK | 2 | 2 |
| **DISCLOSURE** | LEVERAGE RATIO DISCLOSURE | 4 | 4 |
| | REVISED PILLAR III REQUIREMENTS | 2,5 | 1 |
| | COUNTERCYCLICAL BUFFER, LIQUIDITY, REMUNERATION, LEVERAGE RATIO | 3 | 2,5 |
| | KEY METRICS, INTEEREST RATE RISK IN THE BANKING BOOK, NSFR | 2 | 1 |
| | COMPOSITION OF CAPITAL, RWA OVERIVIEW, PRUDENTIAL VALUATION ADJUSTMENTS, G-SIB INDICATORS | 3 | 4 |
| | TLAC | 2 | 1 |
| | MARKET RISK | 2 | 1 |

**Figure 9. Implementation Status by jurisdiction**
**Source: BCBS, 2017, December**

The scores assigned range from one (meaning that the draft regulation has not been published yet) to four (that indicates the final rules are published and implemented). The colors show, where it is possible, the status of implementation, which go from the red that

equals to the absence of implementation to the green that stands for full implementation of the laws.

Lastly, the Financial Stress Index (FSI) is a monthly national indicator of the financial distress in the markets composed of the combination of many variables: banking sector beta, term spread, stock market returns and volatility, and so on. This macroeconomic component incorporates the external dynamics on the markets. The higher the value of the FSI, the higher the degree of financial strain. For the emerging markets the index only takes in consideration five indicators,

In these models, $\beta_0$ represents the average of structural indicators when no intervention is made; $\beta_1$estimates the trend in the financial structure; $\beta_2$ measures the changes of the financial structure after the regulation has been implemented; $\beta_3$ measures the effect of the policy change; $\beta_4$ accounts for the impact of the market conditions on the outcomes.

For what concerns the purpose of this analysis, interesting results have been achieved in the securitization to GDP indicator calculated for 11 countries. From the interpretation of the regression betas, high levels of Basel capital rules implementation correspond to low levels in securitization, which has registered an average decrease equal to the 1.8% of GDP in the countries that reached perfect progress.

Similar results are obtained even in the analysis of the Basel liquidity rules progress, which has a negative impact of -1.3% on the securitization to GDP ratio always considering a perfect progress in the implementation of liquidity standards.

### *3.3.1 The setting*

The idea of the following study presents many contact points with the IMF report just described, due to the similarities in both the outcomes considered and the regulation whose effect is considered. For obvious reasons, this analysis cannot be compared to the previous one, since it can only consider a limited number of countries and a very specific market.

As already explained, retrieving non-fragmentary historical datasets for the ABS market is quite difficult, since it has a very complex structure and includes a very wide range of categories. Moreover, the market has followed a recent and fast development;

therefore, even statistics dating back only to 2000 can be only partially comparable to the current market data. Additionally, many available datasets are not updated until 2017.

Therefore, the only possible data used in this study has been collected from the quarterly Securitization Data Reports published by the Security Industry and Financial Markets Association (SIFMA) and Association of Financial Markets in Europe (AFME)[138]. The temporal length of the data covers the years from 2007 to the third quarter of 2017 for a total of 43 quarters. The statistics include many different sections:

- Issuance of the ABSs;
- Balance outstanding ABSs;
- Credit quality and rating changes in ABS markets;
- Spreads among different ABS classes;
- Prices of some ABS instruments;
- Indices and global comparative data.

Some of the accessible data is detailed for all the European countries, while other variables are available only in an aggregate form. Moreover, the report also offers comparison data with the US market. In this analysis, the following data have been chosen as regressions outcome variables:

| COUNTRY | DESCRIPTION | CATEGORIES | PERIOD |
|---|---|---|---|
| EU | **ABS OUTSTANDING BY COUNTRY OF COLLATERAL** | AUSTRIA, BELGIUM, FINLAND, FRANCE, GERMANY, GREECE, IRELAND, ITALY, MULTINATIONAL, NETHERLANDS, OTHER, PANEUROPE, PORTUGAL, RUSSIA, SPAIN TURKEY, UK | 2007:Q3 - 2017:Q3 |
| EU | **ABS OUTSTANDING BY TYPE OF ABS** | ABS, CDO, CMBS, RMBS, SME, WBS | 2007:Q3 - 2017:Q3 |
| EU | **ABS ISSUANCE BY RATING** | AAA, AA, A, BBB & BELOW, NOT RATED | 2007:Q1 - 2017:Q3 |
| EU | **ABS ISSUANCE BY COUNTRY OF COLLATERAL RATING** | AAA, AA+, AA, A+, BBB+, BBB, BBB-, B | 2007:Q1 - 2017:Q3 |

[138] SIFMA and AFME both belong to the Global Financial Markets Association (GFMA), which "represents the common interests of the world's leading financial and capital market participants, and speaks for the industry on the most important global market issues. GFMA's mission is to provide a forum for global systemically important banks to develop policies and strategies on issues of global concern within the regulatory environment"
Source: http://www.gfma.org/about/

| | | | |
|---|---|---|---|
| US | **ABS OUTSTANDING BY TYPE** | ABS, AGENCY MBS, NON-AGENCY CMBS, NON-AGENCY RMBS | 2007:Q1 - 2017:Q3 |
| US | **ABS ISSUANCE BY RATING** | AAA, AA, A, BBB & BELOW, AGENCY MBS, NOT RATED | 2007:Q1 - 2017:Q3 |
| US | **ABS ISSUANCE BY TYPE** | ABS, CDO, AGENCY MBS, NON-AGENCY CMBS, NON-AGENCY RMBS | 2007:Q1 - 2017:Q3 |

Each of those dependent variables has been tested in a multiple regression model that every time is adjusted for the outcome, but it can be generally formalized as follows.
For the EU regressions:

$$s_i^t = \beta_0 + \beta_{1,\dots,k} Categories_{i,1,\dots,k} + \beta_{k+1} Basel\ III\ Proposal_t + \beta_{k+2} Basel\ III\ Implementation_t + \beta_{k+3} Financial\ Stress\ Indicator_{i,t} + \varepsilon_{i,t}$$

For the US regressions:

$$s_i^t = \beta_0 + \beta_{1,\dots,k} Categories_{i,1,\dots,k} + \beta_{k+1} Dodd\ Frank\ Act_t + \beta_{k+2} Basel\ III\ Proposal_t + \beta_{k+3} Basel\ III\ Implementation_t + \beta_{k+4} Financial\ Stress\ Indicator_{i,t} + \varepsilon_{i,t}$$

The outcomes $s_i^t$ listed above are specific time varying quarterly data that change in each regression and they are all denominated in terms of Euro currency basing the exchange rates as of quarter-end.

The multiple categories are defined through the use of qualitative dummy variables that conform to the outcome being considered in each regression. In order to avoid the "*dummy variable trap"*, i.e. the arising of a perfect multicollinearity issue by including all the possible categories in the model and therefore generating a sum of variables that is perfectly predicted by the others, one category is left outside. The missing category is used as a reference or baseline for the other *k* dummy variables included in the model. In this way, the $\beta_1, \dots, \beta_k$coefficients will measure the deviations registered in the *k* categories in comparison to the baseline category. Therefore, the total number of the considered categories is equal to $k + 1$.

The following variables are temporal dummy variables, whose role is to distinguish the different stages in the implementation of the regulation. The implementation on Basel III is divided in two periods for both US and EU regressions:

- From 2012:Q3 to 2014:Q2 in which there is an initial phase that starts with the Basel III proposal of June 2014;
- From 2014:Q3 to 2017:Q3 in which the phase-in arrangements start to be implemented by the countries.

In the US regressions, there is an additional dummy variable for the period that goes from 2010:Q3 to 2012:Q2 that accounts for the Dodd-Frank Act approval and implementation. The coefficients $\beta_{k+1}$, $\beta_{k+2}$ and $\beta_{k+3}$ (just in the US cases) are the most important values in the analysis, since they estimate the effect of Basel III on the outcomes with respect to the baseline period, which goes from 2007:Q1 to 2012:Q2 in the EU regressions and from 2007:Q1 to 2010:Q2 in the US ones. Consequently to the study conducted in the previous chapters, the signs of the betas should be negative in order to confirm the fact that the Basel III rules and the Dodd-Frank Act have had a negative impact on the ABS market. Moreover, one should expect a stronger negative impact in the stage of Basel III implementation with respect to the first stage of proposals, namely $\beta_{k+2}$ should be higher than $\beta_{k+1}$ in absolute terms.

The last variable incorporated in the model is the Financial Stress Indicator (FSI), whose aim is to reduce and possibly eliminate the influence of other external market variables, which could confound the result of the estimated quantitative impact of Basel III reforms.

The FSI chosen for the European country regressions is the Composite Indicator of Systemic Stress (CISS) that is specifically measured for each EU member State and in an aggregate form too.[139] This index, whose data is available for download on the ECB Statistical Data Warehouse website[140], daily assesses the level of the stress in the financial system allowing a better comprehension of the historical crisis events and the forecast of possible future situations of economic distress. This indicator has been proved to have a high statistical power and it is designed to focus on the systemic financial stress dimension. The indicator is composed of 15 variables that assess the financial stress of five main market areas: financial intermediaries; money markets; equity markets that incorporates only non-financial firms; bond markets; foreign exchange markets.

[139] HOLLÒ, KREMER, LO LUCA, 2012
[140] https://sdw.ecb.europa.eu/browseSelection.do?node=9689686

For each of these market segments, a "*raw stress index*" is calculated and then, the resulting indices are aggregated into a unique measure that assigns higher weights to the periods in which many sub indices register a high degree of financial stress. Every raw

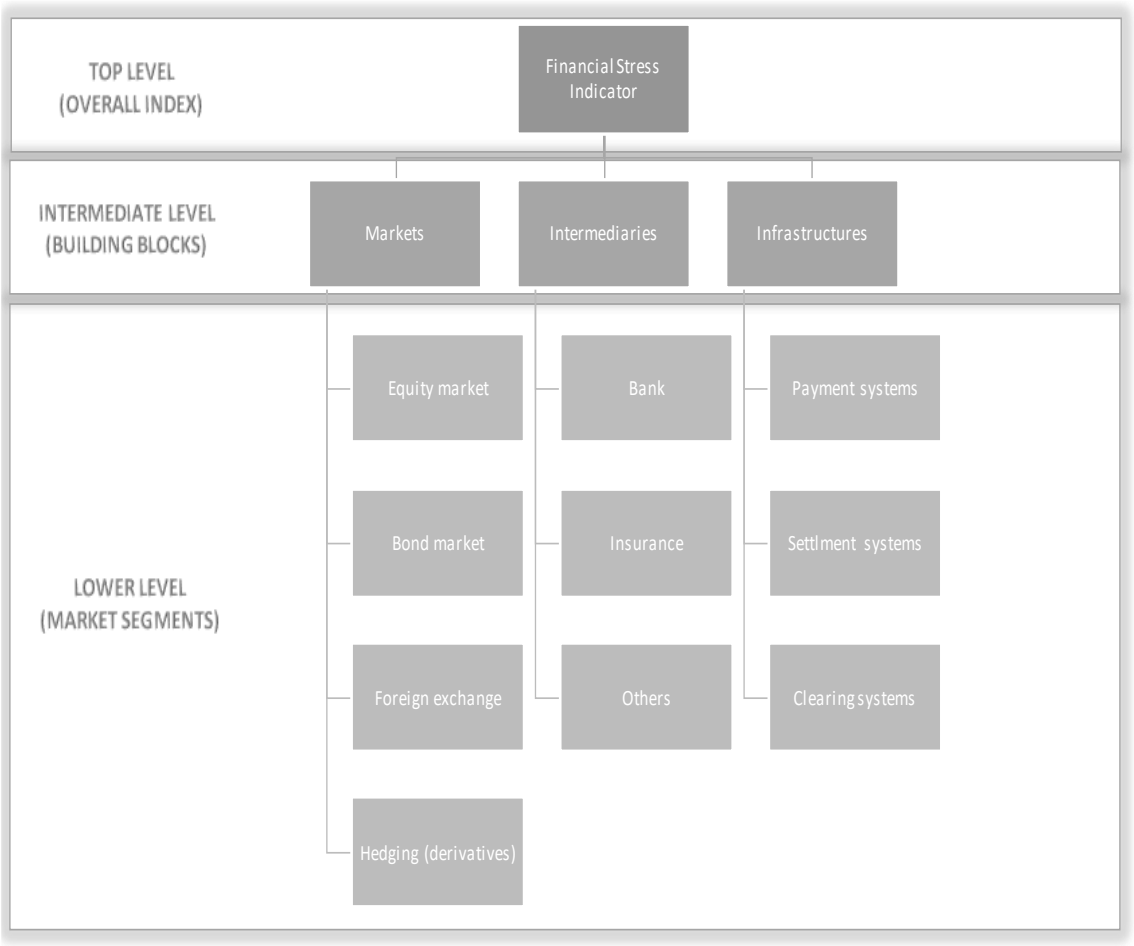


**Figure 10. Structure of a Financial Stress Index**
**Source: HOLLÒ, KREMER, LO LUCA, 2012**

stress index is a composition of many factors among which the most relevant are asset returns volatility and risk spreads. The main innovative features of the CISS index are the standardization of the systemic risk measures, the aggregation of different financial stress indicators and the proposal of methods to compute a crisis threshold.

For the US regressions instead, the Office of Financial Research (OFR)[141] FSI is used. This indicator has born after the specific demands of the Dodd-Frank Act. As the CISS, the OFR FSI is a daily composite stress indicator of financial stress in the worldwide

[141] The Office of Financial Research (OFR) "helps to promote financial stability by looking across the financial system to measure and analyze risks, perform essential research, and collect and standardize financial data"
Source: https://www.financialresearch.gov/about/

economy by calculating a different index for US, advanced economies and emerging markets.[142] Starting from the straightforward high interconnection between real economy and financial crises, the index bases its calculation on co-movement of 33 indicators, which can be grouped into five categories:

- Credit, that includes the credit spreads among enterprises with different creditworthiness which positively covariates with financial distress;
- Equity valuation, which includes stock market indices that measure the willingness of the investors to hold risky assets that is usually inversely related to the financial stress;
- Funding, which measures the easiness of getting funds for financial institutions, that also negatively covariates with the degree of economic crisis;
- Safe assets, whose valuation increases when the liquidity and credit risks are perceived as high;
- Volatility, which contains indicators of implied and realized volatility in different markets that usually are positively related to situations of financial strain.

The standardized value of this FSI is proportional to the weighted average of all the indicators considered. The optimal value that indicates no financial distress is zero, while higher values of the FSI are associated to periods of financial distress. One of the advantages that this index offers relates to its dynamic composition, meaning that the indicators are constantly monitored and they can be replaced whenever evidence shows they are no more a good fit for measuring the financial distress effects.

[142] MONIN, 2017

### *3.3.2 The results*

*- Summary outputs of EU regressions*

**Table 1. Summary output of the outstanding by type of ABS regression**

$$s_i^t = \beta_0 + \beta_1 CDO_{i,1} + \beta_2 CMBS_{i,2} + \beta_3 RMBS_{i,3} + \beta_4 SME_{i,4} + \beta_5 WBS_{i,5} + \beta_6 Basel\ III\ Proposal_t + \beta_7 Basel\ III\ Implementation_t + \beta_8\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,965490452 |
| **R Square** | 0,932171813 |
| **Adjusted R Square** | 0,929781393 |
| **Standard Error** | 86,30124954 |
| **Observations** | 236 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 249,3540071 | 28,12267789 | 2,2603E-16 | 193,9391277 | 304,7688865 |
| **CDO** | -7,081965175 | 19,06762723 | 0,710676349 | -44,65414331 | 30,49021296 |
| **CMBS** | -84,33471542 | 19,06762723 | 1,5108E-05 | -121,9068936 | -46,76253728 |
| **RMBS** | 750,8576383 | 19,06762723 | 2,011E-103 | 713,2854602 | 788,4298164 |
| **SME** | -58,23294335 | 20,63427017 | 0,005193482 | -98,89214364 | -17,57374307 |
| **WBS** | -138,7831244 | 19,06762723 | 5,46883E-12 | -176,3553025 | -101,2109462 |
| **Basel III Proposal** | -45,67400886 | 17,37881737 | 0,009171103 | -79,91843865 | -11,42957907 |
| **BASEL III Implementation** | -103,115597 | 21,8971513 | 4,33229E-06 | -146,263266 | -59,96792792 |
| **CISS FSI** | -32,44040116 | 69,841421 | 0,642744367 | -170,060792 | 105,1799896 |

**Table 2 output of the issuance by ABS rating regression**

$$s_i^t = \beta_0 + \beta_1 AA_{i,1} + \beta_2 A_{i,2} + \beta_3 BBB_{i,3} + \beta_4 Not\ rated_{i,4} + \beta_5 Basel\ III\ Proposal_t + \beta_6 Basel\ III\ Implementation_t + \beta_7\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,701859011 |
| **R Square** | 0,492606072 |
| **Adjusted R Square** | 0,475447823 |
| **Standard Error** | 21,35792238 |
| **Observations** | 215 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 55,8420525 | 5,854262048 | 4,16841E-18 | 44,30043112 | 67,38367388 |
| **AA** | -50,74027087 | 4,606168 | 1,65456E-22 | -59,82128682 | -41,65925491 |
| **A** | -47,35064317 | 4,606168 | 2,72773E-20 | -56,43165913 | -38,26962721 |
| **BBB** | -52,33565756 | 4,606168 | 1,4514E-23 | -61,41667352 | -43,25464161 |
| **Not Rated** | -45,33603366 | 4,606168 | 5,38866E-19 | -54,41704961 | -36,2550177 |
| **Basel III Proposal** | -11,77639715 | 4,283084266 | 0,006496373 | -20,22045662 | -3,332337669 |
| **BASEL III Implementation** | -6,661248905 | 4,696390504 | 0,157584692 | -15,92013766 | 2,59763985 |
| **CISS FSI** | 17,68324759 | 14,47816728 | 0,223333906 | -10,86032008 | 46,22681527 |

**Table 3. Summary output of EU country grouped by S&P ratings[143] regression**

$$s_i^t = \beta_0 + \beta_1 AA +_{i,1} + \beta_2 AA_{i,2} + \beta_3 BBB +_{i,3} + \beta_4 BBB -_{i,4} + \beta_5 B_{i,5} + \beta_6 Basel\ III\ Proposal_t + \beta_7 Basel\ III\ Implementation_t + \beta_8\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,691483482 |
| **R Square** | 0,478149406 |
| **Adjusted R Square** | 0,462478217 |
| **Standard Error** | 11,48009369 |
| **Observations** | 344 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 20,49269742 | 2,057108688 | 1,24319E-20 | 16,44613126 | 24,53926358 |
| **AA+** | -17,95334888 | 2,4793375 | 3,10324E-12 | -22,83048701 | -13,07621075 |
| **AA** | 12,77969365 | 2,47643504 | 4,24092E-07 | 7,908264991 | 17,65112232 |
| **A+** | -17,67380783 | 2,513342985 | 1,1608E-11 | -22,61783861 | -12,72977706 |
| **BBB+** | -8,695019948 | 2,529261065 | 0,000660934 | -13,67036339 | -3,7196765 |
| **BBB** | -9,421066775 | 2,507180267 | 0,000202474 | -14,35297479 | -4,489158763 |
| **BBB-** | -17,95306726 | 2,568900405 | 1,52078E-11 | -23,00638579 | -12,89974874 |
| **B** | -19,39471099 | 2,732433489 | 7,67975E-12 | -24,76971764 | -14,01970434 |
| **Basel III Proposal** | -7,343477583 | 1,765760618 | 4,07446E-05 | -10,81692904 | -3,870026131 |
| **BASEL III Implementation** | -5,106732084 | 1,595023823 | 0,001498107 | -8,244324892 | -1,969139276 |
| **CISS FSI** | 5,061472451 | 3,110007335 | 0,104581125 | -1,056264792 | 11,17920969 |

[143] S&P GLOBAL RATINGS, 2017

**Table 4. Summary output of the ABS outstanding by EU country of collateral regression**
$$s_i^t = \beta_0 + \beta_1 Country_{i,1,\dots,16} + \beta_{17} Basel\ III\ Proposal_t + \beta_{18} Basel\ III\ Implementation_t + \beta_{19}\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,95844 |
| **R Square** | 0,9186 |
| **Adjusted R Square** | 0,9163 |
| **Standard Error** | 38,52 |
| **Observations** | 697 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 9,30134696 | 6,872031667 | 0,176345251 | -4,191710224 | 22,79440415 |
| **Belgium** | 62,67506368 | 8,51152687 | 5,22E-13 | 45,96289989 | 79,38722747 |
| **Finland** | 0,733733105 | 8,51217817 | 0,931334472 | -15,9797095 | 17,44717571 |
| **France** | 48,91376186 | 8,509859164 | 1,37E-08 | 32,20487257 | 65,62265115 |
| **Germany** | 86,95040841 | 8,513622428 | 7,14E-23 | 70,23413005 | 103,6666868 |
| **Greece** | 10,79599188 | 9,421812527 | 0,252261736 | -7,703494355 | 29,29547811 |
| **Ireland** | 39,09824316 | 8,652393229 | 7,34E-06 | 22,1094919 | 56,08699442 |
| **Italy** | 171,6950828 | 8,640585386 | 1,43E-69 | 154,7295159 | 188,6606496 |
| **Multinational** | 118,6402104 | 8,52448341 | 6,60E-39 | 101,9026068 | 135,3778141 |
| **Netherlands** | 264,0404918 | 8,508358535 | 3,36E-132 | 247,3345489 | 280,7464346 |
| **Other** | 1,372209964 | 8,52448341 | 0,872162846 | -15,36539366 | 18,10981359 |
| **PanEurope** | 62,19355759 | 8,52448341 | 8,33E-13 | 45,45595396 | 78,93116121 |
| **Portugal** | 29,34421045 | 8,857994114 | 0,000973024 | 11,95176715 | 46,73665375 |
| **Russia** | -1,499640475 | 8,52448341 | 0,860408169 | -18,2372441 | 15,23796315 |
| **Spain** | 216,9652379 | 8,718836486 | 1,43E-97 | 199,846027 | 234,0844488 |
| **Turkey** | -0,769612414 | 8,52448341 | 0,928089361 | -17,50721604 | 15,96799121 |
| **United Kingdom** | 494,4673512 | 8,508660187 | 2,54E-265 | 477,7608161 | 511,1738863 |
| **Basel III Proposal** | -18,20455937 | 4,252204034 | 2,13E-05 | -26,55365248 | -9,855466272 |
| **BASEL III Implementation** | -29,85501413 | 4,208416617 | 3,29E-12 | -38,11813176 | -21,59189649 |
| **CISS FSI** | 34,13708869 | 9,903367528 | 0,000601869 | 14,69208162 | 53,58209577 |

*- Summary outputs of US regressions*

**Table 5. Summary output on US ABS outstanding regression**

$$s_i^t = \beta_0 + \beta_1 Dodd\ Frank\ Act +_{i,1} + \beta_2 Basel\ III\ Proposal_t + \beta_3 Basel\ III\ Implementation_t + \beta_4\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,932528631 |
| **R Square** | 0,869609648 |
| **Adjusted R Square** | 0,855884348 |
| **Standard Error** | 120,2997839 |
| **Observations** | 43 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 1748,259247 | 37,98846809 | 6,16245E-35 | 1671,355614 | 1825,162881 |
| **Dodd-Frank Act** | -315,5550833 | 64,14681745 | 1,70794E-05 | -445,4135262 | -185,6966404 |
| **Basel III Proposal** | -635,4179244 | 75,16459444 | 2,92316E-10 | -787,5806907 | -483,2551581 |
| **Basel III Implementation** | -488,9063575 | 66,44622921 | 8,10563E-09 | -623,4197161 | -354,3929988 |
| **OFR FSI** | 52,31764812 | 24,01027423 | 0,035603464 | 3,711389091 | 100,9239072 |

**Table 6. Summary output on US Agency-MBS outstanding regression**

$$s_i^t = \beta_0 + \beta_1 Dodd\ Frank\ Act +_{i,1} + \beta_2 Basel\ III\ Proposal_t + \beta_3 Basel\ III\ Implementation_t + \beta_4\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,881942817 |
| **R Square** | 0,777823132 |
| **Adjusted R Square** | 0,754436093 |
| **Standard Error** | 455,0400575 |
| **Observations** | 43 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 3509,683512 | 143,6933147 | 7,77435E-25 | 3218,791604 | 3800,575419 |
| **Dodd-Frank Act** | 885,5107326 | 242,6386029 | 0,000786645 | 394,3145609 | 1376,706904 |
| **Basel III Proposal** | 891,3337468 | 284,3139053 | 0,003308072 | 315,7703361 | 1466,897157 |
| **Basel III Implementation** | 2057,468324 | 251,336245 | 6,50245E-10 | 1548,664696 | 2566,271951 |
| **OFR FSI** | 42,62001908 | 90,82008472 | 0,641551285 | -141,2356304 | 226,4756685 |

**Table 7. Summary output on US Non Agency-CMBS outstanding regression**

$$s_i^t = \beta_0 + \beta_1 Dodd\ Frank\ Act +_{i,1} + \beta_2 Basel\ III\ Proposal_t + \beta_3 Basel\ III\ Implementation_t + \beta_4\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,563235091 |
| **R Square** | 0,317233767 |
| **Adjusted R Square** | 0,245363638 |
| **Standard Error** | 139,6632236 |
| **Observations** | 43 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 505,0951665 | 44,10308762 | 6,90994E-14 | 415,8131333 | 594,3771997 |
| **Dodd-Frank Act** | 36,19977217 | 74,47188193 | 0,629697339 | -114,560671 | 186,9602153 |
| **Basel III Proposal** | 295,2595436 | 87,26307906 | 0,001671588 | 118,6046756 | 471,9144115 |
| **Basel III Implementation** | 110,5607975 | 77,14140675 | 0,159971146 | -45,60381611 | 266,7254111 |
| **OFR FSI** | 20,15181393 | 27,87496526 | 0,474145642 | -36,27810306 | 76,58173092 |

**Table 8. Summary output on Non Agency-RMBS outstanding regression**

$$s_i^t = \beta_0 + \beta_1 Dodd\ Frank\ Act +_{i,1} + \beta_2 Basel\ III\ Proposal_t + \beta_3 Basel\ III\ Implementation_t + \beta_4\ CISS\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,648788871 |
| **R Square** | 0,420926999 |
| **Adjusted R Square** | 0,359971946 |
| **Standard Error** | 135,6829811 |
| **Observations** | 43 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 977,3074903 | 42,84619997 | 8,90012E-24 | 890,5698932 | 1064,045087 |
| **Dodd-Frank Act** | -319,1056824 | 72,34951831 | 8,2044E-05 | -465,5696251 | -172,6417398 |
| **Basel III Proposal** | -277,3297998 | 84,77618092 | 0,002281504 | -448,9502057 | -105,7093939 |
| **Basel III Implementation** | -216,8147835 | 74,94296472 | 0,006283455 | -368,5288839 | -65,10068311 |
| **OFR FSI** | -25,41831486 | 27,08056057 | 0,353854715 | -80,24004363 | 29,40341391 |

**Table 9. Summary output of US ABS issuance by rating regression**

$$s_i^t = \beta_0 + \beta_1 AA_{i,1} + \beta_2 A_{i,2} + \beta_3 BBB\ \&\ Below_{i,3} + \beta_4 Not\ Rated_{i,4} + \beta_5 Agency\ MBS_{i,5} + \beta_6 Dodd\ Frank\ Act_t + \beta_7 Basel\ III\ Proposal_t + \beta_8 Basel\ III\ Implementation_t + \beta_9\ OFR\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,924708032 |
| **R Square** | 0,855084945 |
| **Adjusted R Square** | 0,850289961 |
| **Standard Error** | 40,98145843 |
| **Observations** | 282 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 41,61652899 | 7,219530176 | 2,21818E-08 | 27,40326776 | 55,82979021 |
| **AA** | -37,18557044 | 8,453829386 | 1,56475E-05 | -53,82882596 | -20,54231493 |
| **A** | -36,64224322 | 8,453829386 | 2,05956E-05 | -53,28549873 | -19,99898771 |
| **BBB & Below** | -36,24457312 | 8,453829386 | 2,51326E-05 | -52,88782864 | -19,60131761 |
| **Not Rated** | -6,877192112 | 8,453829386 | 0,416642854 | -23,52044763 | 9,766063401 |
| **Agency-MBS** | 234,9586611 | 8,453829386 | 1,91116E-81 | 218,3154056 | 251,6019166 |
| **Dodd-Frank Act** | -11,33274218 | 7,939949797 | 0,154638547 | -26,9643107 | 4,298826328 |
| **Basel III Proposal** | -9,327470218 | 9,799188092 | 0,342012268 | -28,6193655 | 9,964425063 |
| **Basel III Implementation** | -0,039979094 | 8,530153273 | 0,996263926 | -16,83349526 | 16,75353708 |
| **OFR FSI** | -6,779990922 | 3,179854304 | 0,033888752 | -13,04024592 | -0,519735923 |

**Table 10. Summary output of issuance by US ABS type regression**

$$s_i^t = \beta_0 + \beta_1 Agency\ MBS_{i,1} + \beta_2 CDO_{i,2} + \beta_3 Non\ Agency\ CMBS_{i,3} + \beta_4 Non\ Agency\ RMBS_{i,4} + \beta_5 Dodd\ Frank\ Act_t + \beta_6 Basel\ III\ Proposal_t + \beta_7 Basel\ III\ Implementation_t + \beta_8\ OFR\ FSI_{i,t} + \varepsilon_{i,t}$$

| *Regression Statistics* | |
|---|---|
| **Multiple R** | 0,932777688 |
| **R Square** | 0,870074215 |
| **Adjusted R Square** | 0,865028554 |
| **Standard Error** | 39,96287386 |
| **Observations** | 215 |

| | *Coefficients* | *Standard Error* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|
| **Intercept** | 46,60017015 | 7,84619562 | 1,20302E-08 | 31,13102931 | 62,069311 |
| **Agency-MBS** | 233,8072618 | 8,618615027 | 6,33182E-70 | 216,81526 | 250,7992636 |
| **CDO** | -19,06845865 | 8,618615027 | 0,028032279 | -36,0604604 | -2,076456899 |
| **Non Agency-CMBS** | -26,42010677 | 8,618615027 | 0,00246434 | -43,41210852 | -9,428105015 |
| **Non Agency-RMBS** | -21,33672919 | 8,618615027 | 0,014105706 | -38,32873094 | -4,344727438 |
| **Dodd-Frank Act** | -24,80635898 | 9,5297603 | 0,009911944 | -43,59472616 | -6,017991803 |
| **Basel III Proposal** | -21,19302657 | 11,16657999 | 0,059107841 | -43,20846015 | 0,822407021 |
| **Basel III Implementation** | -9,810059129 | 9,871364822 | 0,321491224 | -29,27191557 | 9,651797309 |
| **OFR FSI** | -10,94991921 | 3,567007176 | 0,002430625 | -17,98244033 | -3,917398088 |

### *3.3.3 Discussion about the major findings*

*- Analysis of the EU regression outputs*

As it can be seen from the regression outputs, the results are in line with what one should have expected from the discussion carried on so far. Two regressions analyze how the level of outstanding ABSs changes with respect to Basel III interventions while other two regressions analyze the effects of the regulatory changes on the issuance levels.

The Adjusted $R^2$ in the regressions run on the outstanding ABSs both grouped by type and by country of collateral are 0.93 and 0.92 respectively, meaning a very good fit of the model to the data trends registered from 2007 on.

The Adjusted $R^2$ in the regressions whose outcome variables are the issuance categorized first by the rating of the ABSs and then by rating of the issuer country are both lower, and they assess correspondingly to 0.48 and 0.46, which are still good achievements considering that the collected data presents a very irregular trend.

In the graph below the coefficients relating to the Basel III proposal and implementation are plotted with their confidence intervals. All the betas are negative but the most significant ones are obtained in the regressions on the outstanding levels.

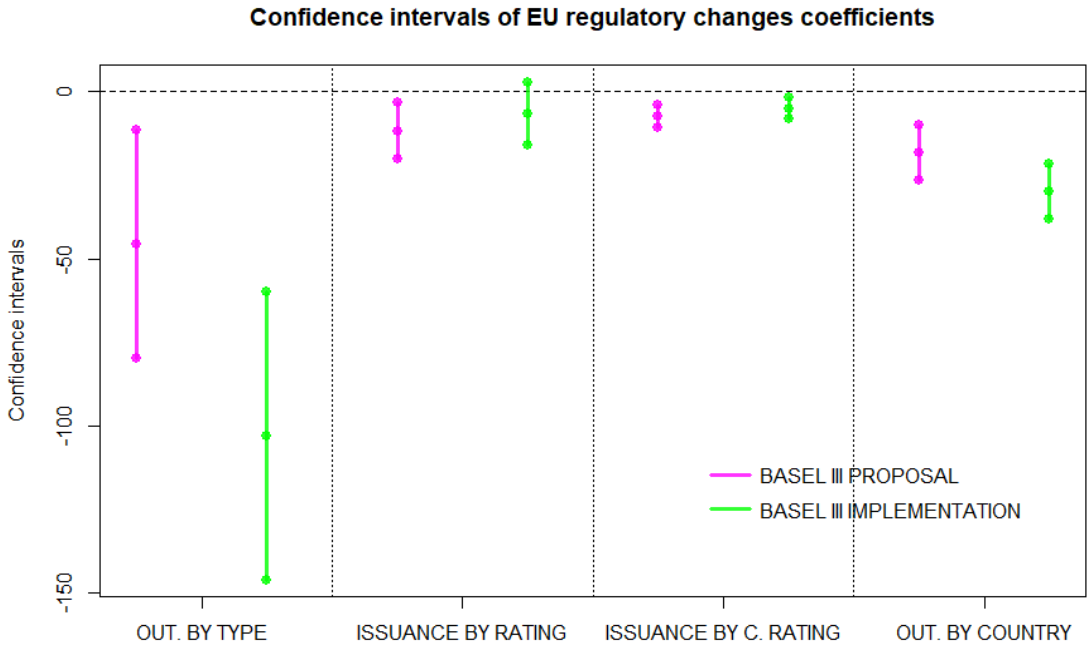


**Figure 11. Confidence intervals of EU regulatory changes regression coefficients. From the left results obtained from the regressions described in: Table 1, Table 2, Table 3 and Table 4**
**Source: R software**

For example, in the first regression represented in Figure 11, after Basel III proposal, keeping all the other regressors constant, it is registered a decrease in the outstanding level of ABSs equal to EUR 45.67 billions on average with respect to the level of outstanding in the previous period. Moreover, it is enlightened an average decrease of EUR 103.2 billions from the moment in which Basel III rules start to be implemented.

*- Analysis of the US regression outputs*

For the US market, six different regression analyses have been run. The first four regressions, whose coefficients are plotted in Figure 12, measure the impact of the regulatory measures on the four single classes of outstanding ABSs. In these cases, very different results are obtained depending on the type of instrument considered.

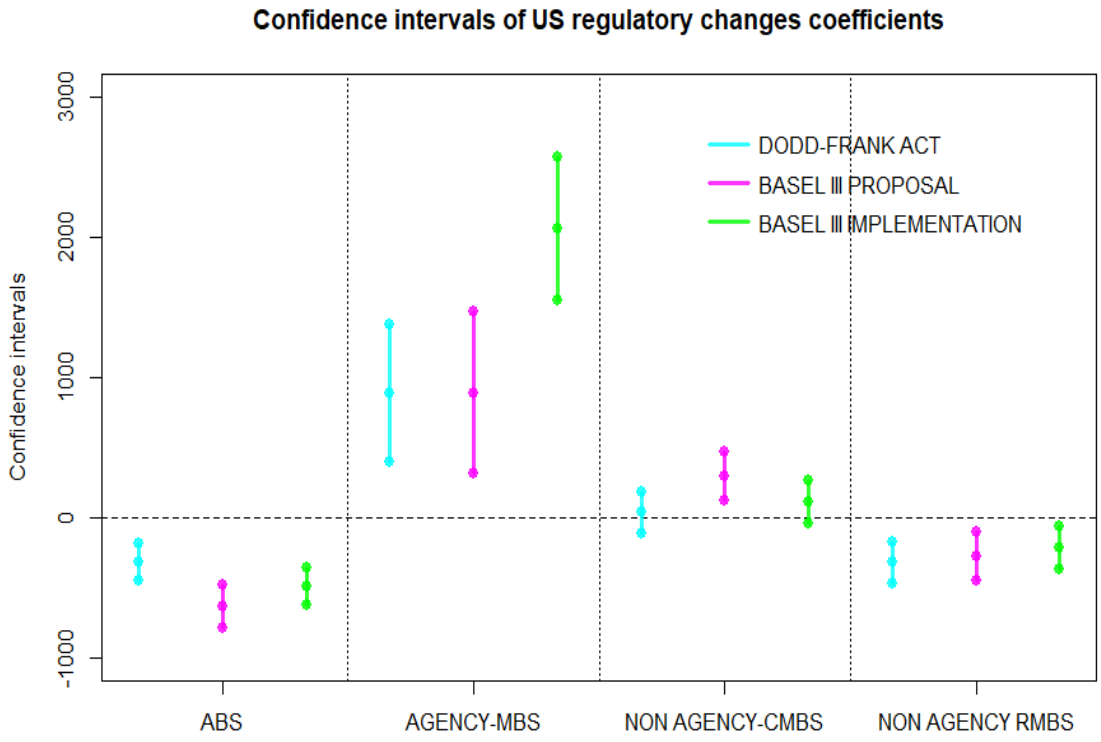


**Figure 12. Confidence intervals of US regulatory changes regression coefficients. From the left results obtained from the regressions described in: Table 5, Table 6, Table 7 and Table 8**
**Source: R software**

In fact, in the ABS class, which includes auto loans, credit cards, equipment and student loans, CDOs outstanding, very negative and significant effects are recorded after the introduction of the new regulatory measures. On average, the decreases resulting from the regression analysis are: EUR 315.5 billions after the introduction of the Dodd-Frank

Act; EUR 635.4 billions after Basel III proposals; EUR 488.9 billions after the beginning of Basel III implementation with respect to the baseline levels.

Similar results are achieved in the Non Agency RMBS segment, while positive average increases in the outstanding levels of Agency MBS and Non Agency CMBS are highlighted. The conclusion is straightforward: evidence clearly shows that the regulatory measures introduced in US have shifted the investors towards the safer ABSs security classes.

The last two regression analyses focus on the issuance levels of US ABSs, grouping them by rating and by type. Table 9 and 10 show the coefficients found. The Adjusted $R^2$ are both over 0.85 and the betas are all negative, enlightening a stronger negative impact of the Dodd-Frank Act with respect to the introduction and implementation of Basel III rules.

# CONCLUSIONS

This paper's aim has been to analyze the huge development of the ABS products in the recent years, focusing on the European and the US markets. The process of securitization, that is deeply connected with the ABSs, has modified the entire financial world by stretching the intermediation chain.

Using the ABSs can lead to many advantages for all the parties involved. In primis, the originators of these securities can access to an extra source of liquidity by transmuting illiquid loans that should be kept in the balance sheet until maturity into tradable securities. This allows the originators to easily sell these illiquid investments and get free of the credit risk associated to the assets, therefore improving the overall risk of the institutions. Moreover, the diversification effect obtained through the pooling of many different credit positions can reduce the total risk, which translates into higher ratings and lower interest rates for the investors. Another important benefit linked to these particular securities is related to their extension in the variety of the investment opportunities offered, thanks to the availability of more risk-return profiles, which consent the tailoring of the assets on the investors' needs. For all these reasons, the securitization is an important tool to achieve higher levels of welfare and economic growth.

But, as it has been underlined, not all that glitters is gold. In fact, there are several risks of potential threat for the ABS investors that must be taken in great consideration by legislators and limited in the optimal way. These vulnerabilities have been highlighted during the Great Recession. Therefore, the purpose of this work gives some food for thought to find new roads to better regulate the ABSs by enhancing and promoting this market segment and not just asphyxiating it with too heavy regulatory requirements.

In fact, due to their great involvement in the financial crisis, the ABS market has known a profound shrink from 2007 on. The investors have started to be afraid of the possibility of great losses and their lack of trust in the robustness of these securities has frozen their trading during the period of highest financial turmoil. After that dark period that has regarded all the markets, the recovery of the ABSs has been slower in comparison to the expectations.

Starting from this evidence, a deeper analysis of the regulatory constraints on this market, intervened in reaction to the financial crisis disaster, has been conducted.

In the course of the second chapter, the regulatory measures taken from 2007 on have been explained in detail. Both the FED and the ECB have tried to stimulate the recovery of the economy through many interventions: the lowering of the interest rates, quantitative easing measures (i.e. financial initiatives aimed to expand the quantity of assets held by the central bank and therefore the monetary base) and several purchase programs of ABSs aimed to revitalize the market and restore confidence between the financial counterparties.

Furthermore, two main regulatory policies have been analyzed: the Dodd-Frank Act and the Basel III reform.

The Dodd-Frank Act, approved by the US government in 2010, is aimed to create a more stable and transparent market to overcome the problems arisen during the crisis. Apart from several provisions about new obligation to report of the financial institutions and the creation of several new agencies aimed to oversee different aspects of the markets, the act impacts on the ABS market with many requirements about due diligence, disclosure, warranties which have a very strong effect on the compliance costs, especially for small enterprises.

Basel III reform, instead, is applicable to both US and EU, but it has a major impact on the second one, since no other reforms had been implemented in response to the crisis.

It consists of an adjustment of the already existing Basel II framework, which had proved to be inappropriate to manage all the risks of the securitization process. The aim of the various proposals is to create a STS securitization framework, namely a simple, transparent and standardized environment for the ABS market, by overcoming all the shortcomings enlightened from 2007. In particular, the reform has targeted the overreliance on external credit ratings, the wrong risk weights for capital requirements for securitized products, and cliff effects in the requirements.

By changing the methodological approach to define the risk weights and introducing new indices to measure the solvency of the banks, Basel III targets the securitization processes making them inconvenient for many financial institutions. In the insurance area, the things are not very different, since the reform of Solvency II provides very high capital charges for the securitized products in comparison to other similar classes of instruments, such as covered and corporate bonds.

From the outline performed, it becomes evident that the regulatory reforms in place are very limiting measures for the institutions that want to buy and hold ABSs with respect to other asset classes whose buffers and capital requirements are lower, even if characterized by similar levels of risk. In addition, the lack of harmonization of the rules in place among the different countries joint to the ever evolving process of the jurisdictions feeds the uncertainty of the investors' expectations, which do not feel comfortable to invest in those securities.

To strengthen this thesis, in the third chapter of this thesis, a regression analysis is conducted in order to estimate the effects of these new regulatory measures on the levels of issuance and outstanding of the ABSs from 2007 to the end of 2017.

The study is inspired by the IMF report of 2012, but it focuses just on the securitization process. Ten different regressions about both the EU and US market try to capture the impact of Basel III proposal and implementation (and also of the Dodd-Frank Act for the US cases) adjusting for confounding, i.e. the possible biased estimate of the effect due to the exclusion of factors that both affects the outcome and the other dependent variables, through the inclusion of a Financial Stress Index.

The results achieved using the statistical software R are in line with the discussion carried out so far. Negative regression coefficients show a strong negative impact on the level of both outstanding and issuance of the ABSs. An interesting exception relates to the US market, since the effects are quite different depending on the class of ABS considered. Not surprisingly, the safest segment of this market, namely the Agency MBS and the Non Agency CMBS experience a positive impact of the reforms, while the ABSs and the Non Agency RMBS register a significant negative impact after the approval of the regulatory reforms. More homogeneous results are obtained in the EU market, which has always been more cautious with respect to the US.

As already enlightened in the discussion, the study has its limitation in terms of availability of data and implementation means, but it offers a simple and straightforward picture of the too punishing regulatory environment for the ABS market, which could be very useful for the progress of the worldwide economy, mainly through the improvement in the credit conditions, and by providing more liquidity and an additional source of financing to the market, in particular to SMEs.

Further developments of this analysis might comprehend adding more adjusting variables for the confounding problem in the model and might also include other classes of securities to measure the differences in the impact of the recent regulatory policies.

Finally, it can be inferred that the ABS products have a real potential, and that their characteristics should be exploited for a better functioning of the economic system, but it is also true that they should be handled with care. For this reason, the regulators of all over the world have started a process of regulatory implementation, which was absolutely necessary in light of the lessons learned after the financial crisis that nonetheless it should also be streamlined in light of the financial institutions' needs.

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WALL STREET JOURNAL: https://www.wsj.com/europe

WORLD FINANCE: https://www.worldfinance.com/

LUISS GUIDO CARLI UNIVERSITY

Department of Economics and Finance
Chair of Asset Management
LM Thesis

# *The ABS market: securitization and regulatory responses after the financial crisis*

## SUMMARY

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# EXECUTIVE SUMMARY

During the last twenty years, the worldwide markets have witnessed an overwhelming process of financial innovation, which has completely revolutionized the traditional model of intermediation. In this context a quick and massive development of a new class of structured products has occurred: the Asset-Backed Securities (ABS).

At the center of the securitization process, the ABSs are characterized by powerful peculiarities, which make them very useful tools for the financial institutions.
Before the beginning of the financial crisis, the growth of this market segment has been exponential. The advantages connected to the securitization process are many, such as the generation of new liquidity from potentially illiquid assets; the construction of retailed instruments for the specific needs of the investors; the creation of instruments with attractive risk-return profile. Driven by the several benefits, many financial firms have exploited the securitization process to create ABSs with increasingly lower creditworthiness that were often mispriced and rated as high quality instruments, usually backed by US subprime mortgages.

When the house bubble burst triggering the price collapse of the residential properties and the consequent failure of many borrowers, the weaknesses of the system have revealed, and many now worthless ABSs, which had spread in all the financial system have been the major reason behind the failure of many institutions.

It is for this reason that these instruments have been stigmatized by the actors on the global markets, who blamed them as the unique cause of the financial crisis. It is important to understand that they are not harmful instruments by construction and, if used in the proper way they can lead to great improvements for all the stakeholders of the financial markets.

Starting from this point, this paper has the aim to enlighten the potential benefits of the ABSs and show that the extreme caution that has pervaded the markets after the recent crisis towards these securities has brought to the design of an excessively penalizing regulatory environment, which does not allow the correct development of these financial products.

To validate this intuition, a quantitative analysis on the US and EU ABS markets is carried out in order to confirm and assess the deleterious effects of the regulatory

interventions implemented in response to the financial crisis, especially if compared to other similar classes of assets.

## INTRODUCTION TO THE ASSET BACKED SECURITIES MARKET

The Asset-Backed Securities are one of the major financial innovation experienced in the last decades, which have completely upset the intermediation chain between borrowers and lenders.

Involved in the financial crisis, these products have found themselves in the eye of the storm, and they have just started a recovery process.

The meaning of the term "securitization"[1] defines a financial technique used to convert pools of assets, generally held by a bank in its balance sheet, into financial securities that are tradable on the secondary markets. The principal and interest of these securities depend on the cash flow that are generated by the underlying assets, as it happens with derivative instruments.[2] In practice, the securitization process comes up with the issuance or creation of bonds backed by loans, assets, public works projects, and other illiquid sources of revenue with the goal of turning them into tradable securities. This process is not entirely managed by the bank (also known as originator or sponsor), but it involves several other parties, among which the most important one is the Special Purpose Vehicle (SPV). The SPV is a subsidiary entity of the bank, which is bankruptcy remote from the main organization and constituted with the sole purpose of buying the pooled assets of the bank and issue ABS products to sell in the capital markets.

An ABS is "a security that is collateralized by a discrete pool of assets (such as loans, leases, or receivables) and that makes payments that are based primarily on the performance of those assets".[3]

The securitization process can involve many types of assets detained by the financial institutions, but in the US market, it has mainly prospered in the field of the residential mortgages (RMBS).

[1] Here the term refers to the "*true-sale*" securitization process, that differs from the "*synthetic*" securitization, described afterwards

[2] https://www.ecb.europa.eu/home/glossary/html/act1s.en.html#709

[3] https://www.federalreserve.gov/regreform/reform-glossary.htm

Since this market comprehends a very wide variety of instruments, it is a very tricky task to decide which is the best criterion to categorize them. Here, it is followed the taxonomy

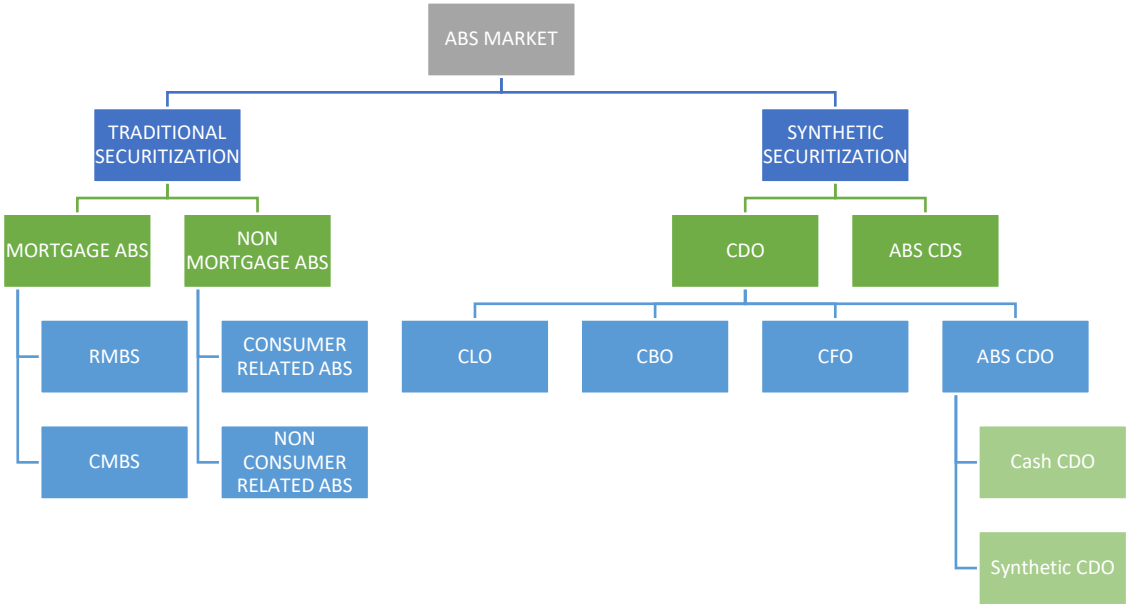


**Figure 1. Categorization of the ABSs classes**

that sorts them on the basis of the type of securitization in which these instruments are involved: the traditional or "true sale" securitization and the "*synthetic securitization*"[4].

All those ABSs whose underlying are loans, legal rights to specific assets and rights to specific cash flows related to real assets belong to the first group. The types of ABSs that, instead, belong to the second group are the ones whose underlying assets are constituted by other ABS securities, subordinated debt, SME loans, or obligations to make payments on derivatives contingent to the occurrence of certain triggering events. The ABSs instruments expose the investors to different kinds of risks. The most characteristic are the prepayment risk (i.e. risk associated with the early and unscheduled return of principal on fixed-income securities that causes the extinction of the obligation) and the early-amortization (i.e. early calls events exposure), while the other relevant risks that investors have to deal with are the interest rate risk, the liquidity risk, the default risk.

[4] "Synthetic securitization means a securitization where the transfer of risk is achieved by the use of credit derivatives or guarantees, and the exposures being securitised remain exposures of the originator institution".
Source: https://www.eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/-/interactive-single-rulebook/article-id/1650

In order to have a clear picture of what is the situation of the ABS market today, it is necessary to take a step back and briefly analyze their role in the financial crisis.

The fundamental guilt of the structured debt, wrongly exploited and misjudged by the main actors of the markets, has been the broadening of the real-estate bubble to a financial level. The securitization process has amplified the magnitude of the effects of the crisis on real economy through the impact on many factors[5]:

- The lengthening of the intermediation chain;
- The misaligned incentives between the actors of the securitization chain and the market;
- The complex structure of the financial products, like in the case of synthetic CDOs;
- The overreliance on mathematical models and external risk assessments, that are based on historical data;
- The increase in individual and systemic bank risks.

From 2007-08 on, all the securities belonging to the structured debt sector experience a huge fall of their prices all over the world and the ABS market slumps: the supply increases and nobody wants to buy them since the collaterals are mostly mortgages that will not be repaid by the borrowers.

After this stage of intense crisis though, both in Europe and in the US markets, there are signs of a slow recovery, but as it can be observed from the data, especially when it comes to the European case, the composition of the collaterals results extremely changed. Therefore, the ABS market and the structured debt market have become much safer and solid after the lesson harshly learned with the financial crisis, but despite this evidence, they are very far from reaching again the dimension they had in the pre-crisis period. One partial explanation to this phenomenon rests on the regulation activity of the European and American legislators of the latest years, which has maybe been too punitive towards this market in comparison to others, such as the covered bonds[6].

[5] DELIVORIAS, 2016

[6] Covered bonds are very liquid securities issued by banks, which are guaranteed by a specifically destined portion of the institution assets. Therefore they are considered safer instruments with respect to ABSs

## THE BARRIERS TO THE DEVELOPMENT OF THE ABS MARKET

The second chapter of this work aims to enlighten the characteristics of the securitization process that make it so valuable for the correct growth of the economy and detect the major obstacles created by the regulatory measures for their correct development.

The main positive effect of securitization relates the originators of the loans composing the asset pool: they can use securitization in order to increase their funding activity and lend more money to the real economy, benefiting from the removal of those assets and the relative risk from their balance sheet. In fact, they can reduce the capital reserves imposed by the Regulators, and use them to increase their leverage. This process, which has a positive impact on the risk management of the institution, can generate value for the institution itself that can achieve greater profits and reduce the cost of intermediation by capturing part of the lending profits, for the shareholders of the originator, and ultimately for the whole economy of the country. In addition to the relocation of the credit and the interest risk, securitization is a powerful tool used to transfer of the servicing risk, i.e. the uncertainty that the loan are not serviced in a timely and efficient manner.

The issuers can take advantages from the reduction of the interest costs[7] and the increase in efficiency, achieved with the separation of the securitized bonds rating and the rating of the single loans. The phenomenon of the improvement in the credit conditions mostly depends on the benefits arising from the diversification effect.

Even the investors can get diverse benefits from the process. First of all, the securitization offers more retailed investment opportunities since it widens the variety of products offered on the market, each one characterized by different risk-return profiles and maturities and, therefore, the investor base. Furthermore, these instruments also offer higher yields with respect to equally rated securities and, for this reason, they can be used for different strategies purposes.

Other positive impacts can be achieved on the markets: the widespread of the risk among different actors on the market can reduce the individual risk borne by the individual entity, and they can also improve the efficiency of the price formation of the underlying assets, that are usually more difficult to be evaluated.

[7] The interest cost is the cumulative sum of the amount of interest paid by a borrower on a loan

Finally, the securitization can also bring many advantages for the overall economy: as enlightened in many studies, it favors the decrease of geographical and regional disparities through the improvement of the access to credit in terms of quantity and costs as a direct consequence of the secondary market efficiency. The spreading of the risks among different counterparties has a positive impact on the individual and systemic levels of risk [8]. Therefore, securitization can be seen as a strong tool that can help the stimulation and the support of the economic growth in a variety of sectors.

One of the key asset classes in which the peculiarities of the securitization can enhance the growth and the efficiency of the market is the SME loans[9] area, which is a particular market segment especially present in the European Union.

From this brief overview, it can be concluded (and it is generally acknowledged) that well-regulated, good quality and less opaque securitized products can play an important role in the worldwide markets. In one sentence, "prudently-designed" ABSs can be the key to unlock and restart the economy.

During the years after the burst of the financial crisis, the regulators of all the world have committed in pursuing a more robust financial system. The following analysis is going to focus on the interventions made in the US and EU markets, explaining all the efforts that have been made by the authorities in order to restore and enhance the functionalities of a healthy securitization market, but also enlightening that their extreme caution might be an obstacle for its correct development. In fact, it is acknowledged that the ABSs play a fundamental role in the support the supply of credit; therefore, a series of measures have been implemented with this purpose.

The main area targeted by these new reforms concerns more prudent capital requirements of the financial institutions to strengthen their resiliency, but some other initiatives have also focused on establishing facilities designed to improve the liquidity of the securitized products.

Along with the specific interventions made by the FED, on June 21st 2010 the Congress approves the "Dodd-Frank Wall Street Reform and Consumer Protection Act", a huge reform made in response to the financial crisis whose goal is to create a more stable and

[8] EUROPEAN SECURITISATION FORUM

[9] A SME loan is the financing of a small or medium-sized enterprise through the concession of a line of credit. It is comprehended in the wider category of the SME financing, that includes all the forms of financing that can be used by a SME such as bond or equity issuances, leasing, factoring, venture capitals and so on

transparent environment in which the institutions and the investors can operate in a safer way. In the ABS sector, this reform has translated into seven proposed rulemaking provisions, and the SEC has approved only six of them (Sections 941 – 945).[10] They relate to the credit risk retention, the ABS disclosure, representations and warranties, and due diligence. Three are the main rules that have an impact on the ABS market.

The Volcker Rule, implemented in 2013, prohibits the banking institutions to acquire and retain an ownership interest or some other relationships, such as proprietary trading, with hedge funds, private funds and in particular "*covered funds*", some exception being made (e.g. the "Permitted seeding and *De Minimis* Investments" rule[11]). Since in the provided definition of covered funds many ABCP conduits fall into this classification (even if there are some specific exemptions for particular issuers of ABSs), and the banks very often detain what is defined as an ownership interest, this rule directly affects the quantity of ABSs that can be held by the banking entities. For example, the aggregate value of all ownership interests of the entity and its affiliates in all covered funds acquired or retained under the seeding and *de minimis* investment exemption cannot exceed the 3% of Tier 1 capital[12] of the banking entity, calculated as of the last date of each calendar quarter.

Another example of provision that directly affects the ABS market is the change in the Commodity Exchange Act (CEA)[13], which establishes that a fund, a SPV, trust or similar arrangement that enters into one or more swaps can be defined as a "commodity pool".

[10] Source: https://www.sec.gov/spotlight/dodd-frank.shtml#

[11] This rule allows the acquisition and the retention of an ownership interest in a covered fund "for the purposes of establishing the fund and providing the fund with sufficient initial equity for investment to permit the fund to attract unaffiliated investors, or for purposes of making a *de minimis* investment in the fund"
Source:
https://www.morganlewis.com/~/media/files/handouts/volcker_rule_and_structured_transactions_handout.ashx

[12] "Tier 1 capital, used to describe the capital adequacy of a bank, is core capital that includes equity capital and disclosed reserves. Equity capital is inclusive of instruments that cannot be redeemed at the option of the holder". In US as in EU the capital ratio is equal to the 6% of the total risk exposure, where the 4.5% must be composed of Common Equity Tier 1 (highest quality part of capital formed of common shares, retained earnings and other reserves)
Source: https://www.investopedia.com/terms/t/tier1capital.asp

[13] "The Commodity Exchange Act (CEA) regulates the trading of commodity futures in the United States. Passed in 1936, it has been amended several times since then. The CEA establishes the statutory framework under which the CFTC operates"
Source: http://www.cftc.gov/LawRegulation/CommodityExchangeAct/index.htm

The major implication of this rule is that each commodity pool CPO[14] and CTA[15] must be registered with the CFTC and satisfy the specific standard imposed. Moreover, the commodity pools are caught in the definition of covered fund, therefore, also the limits imposed by the aforementioned Volcker Rule.

Qualified Residential Mortgages (QRM) rule, effective from January 2014, aims to contrast the lax lending standards experienced during the financial crisis. Already targeted by the Truth in Lending Act (TILA)[16] of 2008, the QRM rule defines some specific elements to be considered in order to assess the compliance of the mortgages in the category of "qualified mortgages" (the ability-to-repay determinations, presumption for QM, general requirements for QM, rural balloon-payment QM, other additional provisions).[17] These QRMs, characterized by a lower risk of default, are not subjected to the general risk retention rule that provides a retention rate of 5% of the credit risk of assets securitized for the issuers of ABSs: this is an attempt to restore a healthy and liquid private-label MBS market.

In the European Union, the development of the financial crisis follows a different course. At first, the burst of the US housing bubble does not seem to affect so much the European banks and institutions, which had not been deeply involved in the ABSs investments, especially the worse quality ones. Nevertheless, from 2008 a progressive lack of trusts spreads overseas too, and progressively starts to highlight all the preexistent structural limits of the Union, majorly caused by the harsh differences among the State Members.

The regulatory initiatives that have affected the ABSs from 2007on are numerous, and they try to improve all the shortages enlightened by the crisis, such as liquidity, capital and leverage requirements of the institutions, due diligence from investors, governance, credit rating agencies. Contemporarily to these operations of monetary policy, the European regulators have carried out many reforms that affect the ABS market and

[14] A CPO is an entity engaged by the commodity pool with the purpose of receiving from other entities funds, securities or properties to be traded in commodity interests

[15] A CTA is an entity that in exchange for a compensation advises, issues analyses and reports concerning the commodity interests

[16] The TILA is a US law aimed to promote the informed use of consumer credit, requiring higher levels of disclosure regarding terms, costs for the borrowers. It also includes some provisions about the regulation of credit cards and the resolution of credit billing disputes

[17] Source: http://files.consumerfinance.gov/f/201301_cfpb_ability-to-repay-summary.pdf

securitization in general.[18]The purpose of all these proposals, coming from the joint forces of the Basel Committee on Banking Supervision (BCSB)[19], the International Organisation f Securities Commission (IOSCO)[20] and the European Commission, is to form an EU a "*STS securitization*" framework: simple, transparent and standardized.[21] If the instruments held by the banks satisfy the conditions required to be considered as a STS securitized product, they will benefit of differentiated regulatory capital treatment (scaled risk weights and senior risk weight floor of 10%), applied by the banks but supervised by the national authorities.

As already mentioned, the financial crisis has brought to light some deficiencies in the securitization process, allowed by the inefficient regulatory framework at the time, firstly published in June 2004: Basel II.

The major shortcomings of the old rule system have been proved to be: the overreliance on external credit ratings, wrong risk weights, cliff effects in capital requirements. To overcome these issues and integrate the STS criteria into a less vulnerable legislative framework, after the financial crisis there have been many modifications, the so-called "Revisions to the Basel Securitisation Framework". At last, they have converged into the Basel III Reforms, a project announced in 2010 and finalized in December 2017 but not yet fully implemented.[22]

In EU the reform has been implemented transposed into law with the regulation CRD IV /CRR of 2013 on capital requirements for banks, Solvency II directive for insurance undertakings of 2009 (then implemented in 2015 and applicable from 2016) and the Framework for a STS securitization of 2015. Furthermore, the EU regulators have updated in 2013 the CRA regulation.

The main features characterizing the Basel III program are the followings:

[18] BOE, ECB, 2014

[19] "The Bank for International Settlements (BIS) is an international financial organization owned by 60 member central banks, representing countries from around the world […] The mission of the BIS is to serve central banks in their pursuit of monetary and financial stability, to foster international cooperation in those areas and to act as a bank for central banks"
Source: https://www.bis.org/about/index.htm?m=1%7C1

[20]"IOSCO is the international body that brings together the world's securities regulators and is recognized as the global standard setter for the securities sector. It develops, implements and promotes adherence to internationally recognized standards for securities regulation"
Source: https://www.iosco.org/about/?subsection=about_iosco

[21] BCBS, 2017, July

[22] BCBS, 2017, December

- Increase the level and the quality of the capital to cover for the unexpected losses, raising the Minimum Tier 1 capital;
- Enhance the capital requirements, with the Credit Valuation Adjustment (CVA)[23] risk;
- Constrain the bank leverage reducing their risks, introducing a leverage ratio[24] threshold;
- Improve the bank liquidity, trough the Liquidity Coverage Ratio (LCR)[25] and the Net Stable Funding Ratio (NSFR)[26];
- Limit the procyclicality through the construction of stronger countercyclical capital buffers (CCyB)[27].

In the context of Basel III reforms, in April 2014 the "Supervisory framework for measuring and controlling large exposures" has been revised too.[28] The rationale behind this review, that will start to be implemented from January 2019, is to target and limit the large control exposures[29] to single counterparties or groups of connected counterparties that could lead (and have led during the crisis) to huge losses in the financial institutions. The securitization market will be influenced by the reform in the identification of additional risk matter, which is the recognition of the risks associated to a certain structure, more than to an underlying asset. For this reason the ABCP conduits, SPVs, or CDSs sellers themselves are considered as additional factors of risk of the exposure value (i.e. the amount invested), therefore reducing their appeal to the financial institutions.

The implementation of the adequacy measures for the insurance entities is left, at the EU level, to the Solvency II directive under the guidance of EIOPA. The main purposes

[23] The CVA is a measure that can be calculated following different methodologies. It can be expressed as the difference between the risk free portfolio value and the real portfolio value, that takes into account the possibility of default (Debt Value Adjustment or DVA)
[24] The leverage ratio is the ratio between the Tier 1 and the net exposures of the institution (on and off the balance sheet). It should be greater or equal than 3%. The aim is to limit the leverage that a bank should take. For Global Systemically Important Banks (G-SIBs) it is provided a further buffer to be added to the leverage ratio
[25] The LCR promotes the short-term resilience of the liquidity risk profile of banks by ensuring that they have sufficient high quality liquidity assets (HQLA) to survive a significant stress scenario lasting 30 days
[26] The NSFR is defined as the ratio between the available amount of stable funding and the required amount of stable funding. This ratio must be at least equal to 100%
[27] The CCyB is calculated as weighted average of the buffers in effect in the jurisdictions to which banks have a credit exposure and extends the capital conservation buffer. It is implemented at a national level e should vary in a range comprehended between 0 and 2.5%
[28] Source: https://www.bis.org/publ/bcbs283.pdf
[29] An exposure is defined large if it is equal or above 10% of the bank's eligible capital base

of the three pillars are: the creation of a single supervisory regime for the EU insurance sector, the more efficient management of the risks taken, improved consumers' protection, enhanced reporting to anticipate the eventual problems.[30] The main issue regarding this regulation concerns the extremely high capital charges even for high-quality securitization, namely STS securitization, to such an extent that insurance companies have almost entirely abandoned the securitization market.[31]The reform provides three different types of securitization classes to which different capital charges are associated, but they are all very severe if compared with the ones required for covered bonds and corporate bonds. In 2019, there will be amendments to Solvency II, which presumably will lead to: a reduction in the capital charges for what concerns STS securitizations, that will broaden the Type 1 category; reduction in weights, that will become more aligned with covered and corporate bonds. Hopefully, these implementing measures will revitalize the insurance entities activity in the ABS market.

Lastly, other specific provisions regard the CRAs, which are more bounded by stricter conduct rules, after the turmoil they have been experienced during the crisis. The regulatory framework tries to contrast the over-reliance on external credit ratings and the conflict of interest issues, enhance the transparency of ratings, and assign more responsibility to the CRAs for the ratings they give.

In the actual context of macroeconomic downturn and low growth, especially in the Eurozone, the markets are experiencing a slow recovery after the financial crisis stroke the economic system. In order to exploit the advantages of the securitization, regulation should try to alleviate the distress of the ABS market, by promoting the issuance and the tradability of these financial assets. However, from the overview just delivered, it is clear that regulators prefer a more conservative approach to avoid a new misapplication of these powerful tools. Following this path means creating regulatory constraints that alter the well-functioning of the market, impinging on both investors and issuers involved in the securitization.[32] On the side of the investors, the higher capital requirements provided are a deterrent for investing in this kind of securities, since the investment costs associated to them increase, especially for small businesses and insurance companies, which have to

[30] Source: https://eiopa.europa.eu/pages/supervision/insurance/solvency-ii-going-live.aspx
[31] Source: https://www.reuters.com/article/abs-regulations/securitisation-needs-solvency-ii-game-changer-idUSL5N1F M5KN?feedType=RSS&feedName=financialsSector
[32] BOE, ECB, 2014

comply with Solvency II. Moreover, the calculation of many capital buffers rejects the inclusion of the ABS instruments, causing the inconvenience for the financial institutions to hold them in the portfolios with respect to other classes of assets which give the opportunity of a long-term financing (covered and corporate bonds mainly).

The lack of harmonization among the rules implementation is another factor to be considered. The risk retention requirements are inconsistently put in force across the diverse jurisdiction and this causes the stoppage of free investment flows, since they try to exploit these variations by investing just in the most convenient country from a regulatory point of view.

The last, but not the least aspect to be analyzed is the impact of the investors' expectations. In a period of regulatory uncertainty in which many times a year the government entities make proposals, tunings and introduce technical standards to better adjust the existing framework to the needs of the markets, the investors may have some difficulty to believe in the solidity of the ABS market in the long run. In many cases, the too prudent behavior and distrust of the investors affects the secondary market liquidity more than the regulation in place. This issue also reflects on the behavior of the asset managers that do not propose this kind of product to their clients, which might perceive these instruments as too risky assets, a belief amplified by the fragmentation in terms of jurisdiction but also of legal framework, trading venues, data analyses.

Even on the issuers' side, the uncertainty linked to the continuous development of the regulatory background is an element that negatively influences their willingness to hold the ABSs in their portfolios, and the too punitive capital charges applied amplify this trend.

## MEASURING THE IMPACT OF THE REGULATORY MEASURES ON THE SECURITIZATION MARKET

The third chapter of the thesis wants to focus on the measurement of the regulations effect on the securitization market of the European Union.

Estimating the impact of the regulation without confusing it with the effect of other external factors on the economy is not a trivial task, and it strongly varies with the type of regulations under discussion and the time period being considered.

A simple regression study about the impact of the regulation over time can show the effects of the measures adopted, but it has to be handled with care since it could lead to erroneous considerations about the true contribution of the policy change to those effects.

Therefore, a multiple regression can be a more appropriate instrument to take in consideration different factors that can have an influence on the outcome and to give insights about the role of each of these factors in the outcome changes, assuming that the effects of the variables considered on the outcome are linear.

The data used in this study has been collected from the quarterly Securitization Data Reports published by the Security Industry and Financial Markets Association (SIFMA) and Association of Financial Markets in Europe (AFME)[33]. The temporal length of the data covers the years from 2007 to the third quarter of 2017 for a total of 43 quarters.

In this analysis, the following data have been chosen as regressions outcome variables:

| COUNTRY | DESCRIPTION | CATEGORIES | PERIOD |
|---|---|---|---|
| EU | **ABS OUTSTANDING BY COUNTRY OF COLLATERAL** | AUSTRIA, BELGIUM, FINLAND, FRANCE, GERMANY, GREECE, IRELAND, ITALY, MULTINATIONAL, NETHERLANDS, OTHER, PANEUROPE, PORTUGAL, RUSSIA, SPAIN TURKEY, UK | 2007:Q3 - 2017:Q3 |
| EU | **ABS OUTSTANDING BY TYPE OF ABS** | ABS, CDO, CMBS, RMBS, SME, WBS | 2007:Q3 - 2017:Q3 |
| EU | **ABS ISSUANCE BY RATING** | AAA, AA, A, BBB & BELOW, NOT RATED | 2007:Q1 - 2017:Q3 |
| EU | **ABS ISSUANCE BY COUNTRY OF COLLATERAL RATING** | AAA, AA+, AA, A+, BBB+, BBB, BBB-, B | 2007:Q1 - 2017:Q3 |
| US | **ABS OUTSTANDING BY TYPE** | ABS, AGENCY MBS, NON-AGENCY CMBS, NON-AGENCY RMBS | 2007:Q1 - 2017:Q3 |
| US | **ABS ISSUANCE BY RATING** | AAA, AA, A, BBB & BELOW, AGENCY MBS, NOT RATED | 2007:Q1 - 2017:Q3 |
| US | **ABS ISSUANCE BY TYPE** | ABS, CDO, AGENCY MBS, NON-AGENCY CMBS, NON-AGENCY RMBS | 2007:Q1 - 2017:Q3 |

[33] SIFMA and AFME both belong to the Global Financial Markets Association (GFMA), which "represents the common interests of the world's leading financial and capital market participants, and speaks for the industry on the most important global market issues. GFMA's mission is to provide a forum for global systemically important banks to develop policies and strategies on issues of global concern within the regulatory environment"
Source: http://www.gfma.org/about/

Each of those dependent variables has been tested in a multiple regression model that every time is adjusted for the outcome, but it can be generally formalized as follows.
For the EU regressions:

$$s_i^t = \beta_0 + \beta_{1,\dots,k} Categories_{i,1,\dots,k} + \beta_{k+1} Basel\ III\ Proposal_t + \beta_{k+2} Basel\ III\ Implementation_t + \beta_{k+3} Financial\ Stress\ Indicator_{i,t} + \varepsilon_{i,t}$$

For the US regressions:

$$s_i^t = \beta_0 + \beta_{1,\dots,k} Categories_{i,1,\dots,k} + \beta_{k+1} Dodd\ Frank\ Act_t + \beta_{k+2} Basel\ III\ Proposal_t + \beta_{k+3} Basel\ III\ Implementation_t + \beta_{k+4} Financial\ Stress\ Indicator_{i,t} + \varepsilon_{i,t}$$

The coefficients $\beta_{k+1}$, $\beta_{k+2}$ and $\beta_{k+3}$ (just in the US cases) are the most important values in the analysis, since they estimate the effect of Basel III on the outcomes with respect to the baseline period, which goes from 2007:Q1 to 2012:Q2 in the EU regressions and from 2007:Q1 to 2010:Q2 in the US ones.

The results achieved using the statistical software R are in line with the discussion carried out so far. Negative regression coefficients show a strong negative impact on the level of both outstanding and issuance of the ABSs. An interesting exception relates to the US market, since the effects are quite different depending on the class of ABS considered. Not surprisingly, the safest segment of this market, namely the Agency MBS and the Non Agency CMBS experience a positive impact of the reforms, while the ABSs and the Non Agency RMBS register a significant negative impact after the approval of the regulatory reforms. More homogeneous results are obtained in the EU market, which has always been more cautious with respect to the US.

This study has its limitation in terms of availability of data and implementation means, but it offers a simple and straightforward picture of the too punishing regulatory environment for the ABS market, which could be very useful for the progress of the worldwide economy, mainly through the improvement in the credit conditions and the availability of more liquidity. Further developments of this study might comprehend more adjusting variables for the confounding problem and could also include other classes of securities to measure the differences in the impact of the recent regulatory policies.

## FINAL REMARKS

This paper's aim has been to analyze the huge development of the ABS products in the recent years, focusing on the European and the US markets. The process of securitization that is deeply connected with the ABSs, has modified the entire financial world by stretching the intermediation chain.

Using the ABSs can lead to many advantages for all the parties involved but, as it has been underlined, not all that glitters is gold. In fact, there are several risks of potential threat for the ABS investors that must be taken in great consideration by legislators and limited in the optimal way. Due to their great involvement in the financial crisis, the ABS market has known a profound shrink from 2007 on and, after that dark period that has regarded all the markets, their recovery has been slower in comparison to the expectations.

From the outline performed it becomes evident that the regulatory reforms in place are very limiting measures for the institutions that want to buy and hold ABSs with respect to other asset classes whose buffers and capital requirements are lower, even if characterized by similar level of risks. In addition, the lack of harmonization of the rules in place among the different countries and the ever evolving process of the jurisdictions feeds the uncertainty of the investors' expectations, which do not feel comfortable to invest in those securities.

To strengthen this thesis, in the third chapter a regression analysis is conducted in order to estimate the effects of these new regulatory measures on the levels of issuance and outstanding of the ABSs from 2007 to the end of 2017. Ten different regressions about both the EU and US market try to capture the impact of Basel III proposal and implementation (and also of the Dodd-Frank Act for the US cases) adjusting for confounding through the inclusion of a Financial Stress Index, showing a high negative impact on the levels of issuance and outstanding ABSs.

Finally, it can be inferred that the ABS products have many potentialities, which should be exploited for a better functioning of the economic system, but it is also true that they should be handled with care. For this reason, the regulators of all over the world have started a process of regulatory implementation, which was absolutely necessary in light of the lessons learned after the financial crisis, but that it should also be streamlined in light of the financial institutions' needs.