Financial innovation and the financial crisis of 2007 and 2008: A Coincidence?

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Abstract

Financial innovation is blamed to be responsible for the financial crisis of 2007 and 2008. This research analyzes the relationship between financial innovation and the financial crisis by arguing that excessive risk taking, asymmetric information and failed corporate governance are the main contributors to the financial crisis. The main conclusion is that excessive risk taking of financial firms, asymmetric information as the outcome of complex structured financial products made financial innovation directly responsible for the financial crisis. But it was the combination of the collapse of the mortgage market in the United States caused by subprime mortgages, thereby making financial innovations like mortgage-backed securities and collateralized debt obligations dysfunctional and the excessive risk taking induced by bonus cultures at investment banks together with asymmetric information caused by product complexity and weak corporate governance systems at investment banks, that triggered the financial crisis.

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1: Introduction

Financial innovation is criticized by literatures to be directly responsible for the financial crisis of 2007 and 2008 (Kühnhausen, 2014). This means that there is a causal relationship between financial innovation and a credit crisis (Kühnhausen, 2014). Among these literatures the three most important issues that would make financial innovation directly responsible for the financial crisis are: excessive risk taking by 'highly bonus-driven' business cultures at investment banks (Crotty, 2009) and hidden bonus systems created by lax corporate governance systems at financial firms in general (Jagtiani, 2010), asymmetric information that is caused by the complexity of structured financial products like CDOs (Orlowski, 2008) and failed corporate governance systems that is represented by board failure to successfully implement risk control systems (Kumar, 2013). This means that financial innovation creates excessive risk taking, asymmetric information and failed corporate governance systems. *Does excessive risk taking, asymmetric information and failed corporate governance systems, that are caused by financial innovation, lead to the direct responsibility of financial innovation for the financial crisis of 2007 and 2008?* This research tries to answer this research question.

Excessive risk taking as one of the results of financial innovation is caused by bonus-driven business cultures at investment banks. Decision makers at large investment banks, described as senior management, salespeople, traders and investment bankers specialized in Mergers & Acquisitions and IPOs took huge risks as the outcome of large bonus compensation schemes. These bonuses were paid not only during good times when these investment banks performed well but also during times that they performed poorly. Excessive risk taking, as result of high compensation schemes represented as bonuses, was one of the main causes of the financial crisis of 2007 and 2008 (Crotty, 2009).

Asymmetric information is the result of complex financial products and has contributed to the financial crisis of 2007 and 2008 (Orlowski, 2008). Asymmetric information means that in some situations some people are better informed then others (Mankiw, 2011). Thus, for example a seller of a product has more information about this product than his buyer (Mankiw, 2011). Asymmetric information, caused by financial innovation, is created by hidden risks of default and wrong priced complex financial products (Orlowski, 2008). The risk of default is described as the risk that a borrower can't meet its obligations to the other lender (Bodie, 2014). Hidden risks of default are the result of the process of securitization (Orlowski, 2008). Securitization is the process that is described as the purchase of loans by a specific financial entity (Gorton G. M., 2012). After the purchase of these loans this entity pools these loans together and sells them as a new security to investors in the financial markets (Gorton G. M., 2012). The results are a security that is based on many other products like the mentioned 'pool of loans' (Gorton G. M., 2012). This result in the fact that all the risks that are involved with the new security are from the

pooled loans that are used to construct this new security and are not recognized by investors but only by these financial entities that created this new security (Orlowski, 2008). This is exactly what asymmetric information means, some parties are better informed about certain products than others (Mankiw, 2011). Wrong prices of complex securities are caused by the fact that financial firms have less information about the risk profiles of investors (Orlowski, 2008).

Financial innovations may cause failed corporate governance systems at financial firms. Failed corporate governance systems are caused by the inability to understand complex financial products resulting in failing to live up to their responsibility by boards of directors at many investment banks. Hence these boards of directors did fail in effectively overseeing the risks involved and thus jeopardizing the effective execution of risk management systems. Therefore, failed corporate governance does qualify as one of the important causes of the occurrence of the financial crisis (Kumar, 2013).

Financial innovation could also lead to excessive risk taking that is the outcome of asymmetric information, which is created by complex financial products and lax corporate governance. All these factors combined contributed to the financial crisis of 2007 and 2008. Business line managers at large financial firms took huge risks that result in large bonuses because they have benefit from the information advantage of complex financial products, which is the result of lax corporate governance systems (Jagtiani, 2010).

The three most important consequences of financial innovation being, excessive risk taking, asymmetric information and failed corporate governance systems will be analyzed by literature review and two case studies. The reason for a literature review is that the determination of the causal relationship between financial innovation and the financial crisis is difficult to analyze by quantitative data and regression analysis. The reason for this is that this relationship, between financial innovation and the financial crisis, needs many specific variables to measure and this is difficult to measure by data and regression analysis. The involvement of many financial firms, employers of these firms, investors and the many forms of complex financial products are hard to measure by regression analysis for quantitative data. For example, this research analyzes excessive risk taking by investment banks as one of the determinants of the financial crisis. There were many investment banks with employees that were driven by a strong bonus culture that resulted in high risk-taking behavior. Using the quantitative data method would mean gathering the exact same data from all these institutes and their different employees. This will practically be impossible as they will have different systems of data registration and different workflows.

Literature review is theoretical and to make this analysis more specific and concrete two case studies of the shadow banking system and an analysis of a large financial firm during the crisis will be included to say more about the causal relationship between financial innovation and the financial crisis.

This literature review and the two case studies have both concluded that financial innovations contributed to the financial crisis of 2007 and 2008. The main conclusion of this research is that when financial innovations like credit risk-shifting instruments became dysfunctional, as the result of weak underlying mortgage loans, excessive risk taking, asymmetric information and weak corporate governance systems made financial innovation directly responsible for the financial crisis of 2007 and 2008. Excessive risk taking was the result of a highly driven bonus culture at investment banks that contributed to the financial crisis (Crotty, 2009). Asymmetric information was the result of complex constructions of financial innovations like CDOs, as result, investors were not aware of the real risks associated with these instruments and when they found out the crisis started (Orlowski, 2008). Lax corporate governance systems were the result of failed corporate oversight of the board of directors at investment banks (Kumar, 2013). The result of failed corporate oversight underestimated risks of complex financial products like CDOs that had great consequences for the financial health of the investment banks, which triggered the financial crisis of 2007 and 2008 (Kumar, 2013).

2: Financial Innovation

This part provides a clear overview of the definition of financial innovation and the different kinds of financial innovations in the financial markets. This research first starts to define financial innovation in general. After providing a general overview of the definition of financial innovation there will be an in-depth analysis of the different kinds of financial innovations, like for example collateralized debt obligations and credit default swaps. First the definition of the different kinds of financial innovation will be explained, followed by a description about their function in the financial markets and in the end, by a description about the role they played during the financial crisis of 2007 and 2008. Only ‘the’ financial innovations that are most relevant for this research will be described. The most relevant financial innovations for this research that will be described are collateralized debt obligations, credit default swaps, mortgage-backed securities, residential mortgage-backed securities and securitization institutions like special purpose vehicles and asset-backed commercial paper conduits. The contribution of these ‘relevant’ financial innovations to the financial crisis will also be discussed in detail.

This research will analyze the consequences of financial innovation to determine whether financial innovation is directly responsible for the financial crisis. To provide an accurate analysis of the consequences of financial innovation it is necessary to define and know the different kinds of financial

innovation. With a clear definition and overview of the different kinds of financial innovations it will be easier to judge whether these consequences of financial innovation are indeed responsible for the financial crisis. It is also important to provide a description of the contribution of the different kinds of financial innovations that contributed to the financial crisis. The reason for this is that it provides some insight on the causal relationship between financial innovation and the financial crisis, which is also the main goal of this research.

2.1: The Theory of Financial Innovation

Financial innovation could be described as the mechanism of the creation and popularization of new securities, new financial institutions, markets and technologies (Lerner, 2011). One key feature of financial innovation is the disconnection of security characteristics (Llewellyn, 2008). These characteristics, after their disconnection, could be hold separate or are combined in several ways for the creation of new securities (Llewellyn, 2008). One example of a security characteristic is credit risk, also called the risk of default (Llewellyn, 2008). Credit risk is described as the risk that one of the two parties of a security can't meet its obligations (de Haan, 2015). There are always two parties that are involved with security transactions (Bodie, 2014). The receipt of funds, possible through the issuance of the security, is obtained by one party of the transaction (Bodie, 2014). The delivery of funds, done by the purchase of the security, is done by the second party of the transaction (Bodie, 2014). For example, a company issues stocks or bonds for the need of funds to finance its business operations (Berk, 2012). For example, investors are the providers of these funds through the purchase of these stocks or bonds (Berk, 2012). A stock is described as a share of ownership that have rights to dividend payments, which is the income to any owner of the stock (Berk, 2012). The stock gives also the right to vote on major events like the election of the board of directors of a firm (Berk, 2012). These rights are obtained after the purchase of the stock (Berk, 2012). Bonds are securities that are sold by firms or governments to raise funds today, from investors, in exchange for a fixed payment in the future (Berk, 2012). The investor that purchased the bond does not only receive a fixed amount of the bond on its maturity date but also periodic coupon payments, which is also paid by the firm or government that issued the bond (Berk, 2012). When the funds are obtained by the company they are obligated to provide interest payments to the investor in the form of coupon payments when bonds are issued or dividends when stocks are issued (Bodie, 2014). The fact that the company is obligated for the interest payments to the investor a risk that this company will default on this payment streams is originated (de Haan, 2015). This phenomenon is described as the existence of 'credit risk' which is the involved characteristic of every security (de Haan, 2015).

Financial innovations can be divided in three categories, product, process and risk-shifting innovations (Lerner, 2011). Product innovations are new forms of pooled investment products, new derivatives and

new corporate securities (Lerner, 2011). Process innovations are new ways of pricing transactions, processing transactions or distributing securities (Lerner, 2011). Risk-shifting innovations are characterized by a combination of individual securities that maintain new securities by different risk classes (Lerner, 2011). One example of a risk-shifting innovation is the special purpose vehicle (SPV) which is an entity that is used to create innovative securities for investors within the financial markets and will be discussed in detail below (Fabozzi, 2014).

One form of risk-shifting innovations, blamed for its direct contribution to the financial crisis, are credit risk-shifting securities (Llewellyn, 2008). Credit risk-shifting instruments are the most recent financial innovations in the financial system (Llewellyn, 2008). Credit risk-shifting instruments transfer credit risks to participants within the financial markets like investors that want to absorb this kind of risk. (Llewellyn, 2008). Examples of credit risk-shifting instruments are credit derivatives like credit default swaps (CDSs) (Llewellyn, 2008). CDSs transfer credit risks to parties that are willing to bear this risk against premiums (Fabozzi, 2014). The definition and working of CDSs and their contribution to the financial crisis of 2007 and 2008 will be discussed in detail in the following part. Credit risk-shifting instruments are the type of risk-shifting innovations that are responsible for the financial crisis of 2007 and 2008 (Llewellyn, 2008), and will therefore be analyzed in this research.

2.2: Financial Innovations in the Financial Markets

2.2.1: Special Purpose Vehicles

A special purpose vehicle (SPV) is an entity that is created by a sponsoring firm, like a commercial or investment bank with limiting purposes. This entity could take the form of a limited liability company, a corporation, trust or partnership. The SPV could be a subsidiary or an independent entity, disconnected with the sponsoring entity. SPVs have no employees and make no operational decisions, in fact they only exist on paper. This means that SPVs don't exist physically, that is, nobody could see this institution compared to for example an industrial firm. One important feature of SPVs is that they can't go bankrupt, this means that when the sponsoring entity goes bankrupt the debt holders of the bank cannot claim the assets of its created SPV (Gorton G. S., 2005).

The most important functions of SPVs is securitization. Securitization is described as the 'sale of securities' that are based on a pool of loan payments, hold by a SPV. All these loan payments are originated by a commercial bank or another financial intermediary that has sold these pool of loan payments to the SPV. The renewed securities that are based on these pools of loan payments are sold in the financial markets (Gorton G. M., 2012).

Another important function is described as 'the benefits' that are the result of the process of securitization (Mankiw, 2011). For example, commercial banks that create SPVs enlarge their balance sheets and this creates more possibilities for a bank to lend money to the public. (Mankiw, 2011). Banks have specific rules, set by central banks, about the quantum of deposit funds that banks must hold on their balance sheets, based on their equity and debt holdings (de Haan, 2015). These rules are set to sustain the banks 'financial health' (de Haan, 2015). The reason for this is that saved funds from households are kept as deposits within the bank and must have the possibility to be paid out to its savers always (Mankiw, 2011). Banks make money by transferring its deposits to loans that are supplied to households or companies (de Haan, 2015). The interest rate, charged on the loans supplied by the bank, compared to the paid interest rates on its deposit holdings is higher (Mankiw, 2011). The difference between the interest rate paid to its deposit holdings and the supplied loans is the most important source of profit for commercial banks (Mankiw, 2011). The financing of all these loans, supplied by the bank, which called the bank's assets, is done by its equity or debt holdings (Fabozzi, 2014). Equity holdings are shares and its debt holdings are most of the time bonds (Fabozzi, 2014). Another form of debt holdings within a bank are its deposits because the bank must be able to deliver the funds always on demand of its savers (de Haan, 2015). Thus, deposits are also used by banks for the financing of their assets (de Haan, 2015). The reason for the choice of this form of funding is that savers don't need their funds on every time (Mankiw, 2011). But when banks have filled balance sheets with loans they are constrained to further lending and to the earning of more profits (Mankiw, 2011). The solution to this profit constraint is that commercial banks create SPVs and sell their loans to these SPVs, like mortgage loans and thereby enlarging their balance sheets (Mankiw, 2011). After the sale of these loans the balance sheets of banks have less loans in relation to their debt and equity holdings (Mankiw, 2011). According to the rules of financial regulation banks could lend more money to the public after the sales of loans to SPVs (Mankiw, 2011). This is exactly what banks do, they want to increase their profits, which is one of 'the' most important functions of SPVs (Mankiw, 2011).

SPVs played a crucial role during the financial crisis of 2007 and 2008 in combination with the sponsored entities that created those SPVs (Baily, 2008). The problem was that SPVs, in the period between 2002 and 2006, were mainly concerned with the securitization of subprime mortgages, which were mortgages that lost their value during the financial crisis, which in the end resulted in financial distress and bankruptcy of several banks that were 'the creators' of those SPVs (Acharya, 2009). American citizens that couldn't afford a mortgage received subprime mortgage loans (Acharya, 2009). Almost every American citizen was promoted by the U.S. government, during the Bush Administration, to buy a house, even the ones that couldn't afford a house (Acharya, 2009). This was booming business during the time that the housing prices kept rising (Mankiw, 2011). But when interest rates in the U.S. started to rise

together with the decrease of house prices, problems in the U.S. mortgage market started (Baily, 2008). When the U.S. mortgage market collapsed, many financial firms that created those SPVs were forced to repurchase the mortgage debt of their SPVs back on their balance sheets, which resulted in immediate losses, represented by huge write downs of these mortgage debt (Mankiw, 2011). These write downs of mortgage debt results in the decrease of value on the bank's assets as well (Mankiw, 2011). When the value of these assets decreased the bank had less assets compared to its debt and equity holdings, which meant that the liabilities of the bank increased compared to its devalued assets (Mankiw, 2011). Banks have dividend and interest payments to its equity and debt holders and this will not change when the banks face huge losses from their devalued assets, represented by write downs of subprime mortgage loans (Mankiw, 2011). This problem put many financial firms in financial distress, which was one of the major contributions to the financial crisis (Mankiw, 2011).

2.2.2: Mortgage-backed securities

Mortgage-backed securities (MBS) are securities that could be described as credit risk-shifting instruments (Llewellyn, 2008). MBS are securities that are created from pools of mortgage loans (Acharya, 2009). Investors of MBS receive interest payments based on the underlying pool of mortgage loans, which are represented by different risk classes, named tranches (Acharya, 2009). Thus, pools of mortgage loans are redistributed to different risk classes which represents the degree of credit risk of the underlying mortgage loans (Baily, 2008). Senior tranches are the most save investments in MBS, followed by junior tranches and thereafter equity tranches which are the riskier tranches (Baily, 2008). Each investor invests in one of these tranches that matches with its risk-return profile (Baily, 2008). Senior tranches provide the lowest interest rates, whereas junior and equity tranches offer higher interest rates to investors (Jacobs, 2009). This afore-mentioned process is called securitization which is described as the process of selling new securities that are based on pools of loans for the transfer of credit risks, done by special purpose vehicles (SPVs) that are created by financial institutions (Gorton G. M., 2012).

MBS provide more investment possibilities for investors in real estate securities and this enlarged security demand in the market for mortgages. Another function of MBS is described as the possibility to transfer credit risk to a financial institution like a bank that creates those instruments. Investors of MBS transfer credit risks to banks that guarantee these credit risk-shifting instruments (Judge, 2012).

The financial crisis of 2007 and 2008 was mainly caused by MBS that were made of subprime mortgage loans. MBS that are made of subprime mortgages called subprime MBS. When households began to default on their mortgages the value of subprime MBS decreased rapidly which had great consequences for the investments of financial institutions and investors in these securities. The performance of subprime MBS was positively correlated with the performance of the mortgage market and the value of subprime

mortgages. But when the subprime mortgage market collapsed many investors and financial institutions like banks, which all invested in these securities, faced huge losses which resulted rollover effects to other credit risk-shifting products that were made of subprime mortgage loans (Judge, 2012).

2.2.3: Residential Mortgage-Backed Securities

Residential mortgage-backed securities (RMBS) are products that are designed by sold pools of residential mortgages by special purpose vehicles (SPVs) (Jacobs, 2009). Residential mortgages are based on houses, cooperatives and apartments (Fabozzi, 2014). The originator of residential mortgages are commercial banks, thrifts and mortgage banks. SPVs are securitization entities that pool many residential mortgages for the creation of RMBSs to get benefits of diversification (Jacobs, 2009). The underlying mortgage products of RMBS and these payments are redirected in three tranches, which are all represented by different risk levels (Jacobs, 2009). This are the same tranches that are used in MBS (Fabozzi, 2014). RMBS are also classified as credit risk-shifting instruments which means the possibility of risk reduction by this kind of securities (Judge, 2012).

One of the most important functions of RMBS are the possibilities of diversification which have effects of risk reduction for investors that invest in these securities (Jacobs, 2009). Diversification is described as the process of risk reduction by pooling several loans with different risk classes in one security, that are called " tranches" (Berk, 2012). Diversification is the reduction of risk of securities like stocks, obtained by the creation of a portfolio of stocks that are perfectly negatively correlated with each other (Berk, 2012). Thus, when stock A for example decreases in value after some economic event and stock B is not affected by this economic event, the loss of your portfolio is less compared to the situation when both stocks react in the same way to the consequences of this economic event (Berk, 2012). An example of an economic event is a war in the middle east that has a negative effect on the stocks of an oil company (Berk, 2012). Different risk classes represent, in the case of credit risk-shifting instruments, the risk of default from households of homes with mortgages (Fabozzi, 2014). This risk represents the possibility that house owners can't meet their obligations to the mortgage lender, like a bank, that provide these kinds of loans (Fabozzi, 2014). Thus, when the riskiest loans default, there will be some compensation by the healthier loans that have a higher credit quality and are less likely to default (Berk, 2012). The least riskiest loans in the case of RMBS are represented by households that could easily or normally afford a mortgage for their home and are less likely to default on their mortgages (Jacobs, 2009).

Another important role that RMBS play is described as the provider of protection against adverse selection. Adverse selection is described as a disadvantage of information that is faced by commercial or investment banks about the risk profiles of investors compared to investors. This could result in over- or underpriced securities, because banks base their securitized securities that are offered to investors, only on

an aggregate risk profile of all investors together rather than individual investors alone, because they are less informed about their risk and return profiles. This problem is solved by RMBS, because they exist of many underlying pools of mortgage loans which have different values based on their credit risk. Financial institutions like banks that securitize mortgage loans could for example pick the riskiest mortgages and sell these as a new security, like the RMBS, to investors that have high-risk profiles. Thus, prices of these RMBS are no longer based on aggregate risk profiles of investors but mostly on investors with a high-risk profile which represents exactly the reduction of adverse selection (Jacobs, 2009).

RMBS that were based on subprime mortgages contributed to the financial crisis of 2007 and 2008. At the begin of 2007 when households began to default on their subprime mortgages, the value of subprime RMBS came under pressure and decreased rapidly. Commercial banks, investment banks and investors that bought RMBS for their investments downgraded their balance sheets and faced large losses. Some investment banks like Bear Stearns had financial distress because it had largely invested in subprime RMBS. All these problems at many banks contributed to the financial crisis of 2007 and 2008. Thus, RMBS contributed to the financial crisis by the loss in their value that had direct effect on the financial health of many financial institutions like banks after the subprime mortgage market collapsed in the beginning of 2007 (Jacobs, 2009).

2.2.4: Collateralized Debt Obligations

A security that is backed by one or a pool of diversified debt obligations is called a collateralized debt obligation (CDO). CDOs are applications of the technology of securitization, because its structure is quite the same as the process of securitization. CDOs could be backed by several types of debt obligations like residential mortgage-backed securities (RMBS), bonds of emerging markets, Triple A rated U.S. bonds or junk bonds and loans of domestic and foreign banks (Fabozzi, 2014).

The collateral manager is responsible for the management of the CDO structure, that is, managing the portfolio of the underlying debt obligations. The collateral manager invests in the portfolio of these debt obligations, which forms collateral of the CDO. The issued assets of the CDO that are based on its collateral are called collateral assets. To finance the assets of the CDO debt obligations are issued. Thus, a CDO is created by underlying debt obligations, which are issued by the collateral manager and serve as funds for the purchase of its assets that are based on the issued debt obligations which are referred as collateral of the CDO (Fabozzi, 2014).

CDOs issue equity and debt and uses the proceeds to invest in the portfolio of debt obligations. Companies have assets, which is also the case by CDOs, but these latter assets are formed by loans or

MBS. The liabilities of a CDO are ranged from preferred shares to AAA rated senior debt. The identification of a CDO are its underlying assets (Lucas, 2007).

A CDO is backed by tranches, that is, the underlying debt obligations of a CDO are called tranches or one could say bond classes. There are several tranches: senior, mezzanine and equity or subordinated tranches. CDOs don't have mezzanine tranches. Subordinated tranches don't get ratings but receive a residual cash flow and senior tranches are often rated in investment grades, like triple A-ratings. Interest payments, that are based on these tranches are only possible when the performance of the collateral is sufficient. The collateral manager is also responsible for the interest payments on those tranches. These payments come from its collateral assets, like interest payments of coupons or the sale or maturing of collateral assets (Fabozzi, 2014).

CDOs are important instruments for the transfer of credit risks by banks and portfolio managers (Fabozzi, 2014). The CDOs were more diversified with respect to credit risks than its underlying mortgage backed-securities (MBS). This means that diversification effects in CDOs were better than in MBS. Adverse selection problems are also decreased by CDOs, just as with RMBS (Jacobs, 2009). CDOs are also investment substitutes that should represent save investments for investors with low risk profiles (Lysandrou, 2015).

CDOs were responsible for huge write downs at large financial firms like investment banks that invested heavily in these credit risk-shifting instruments. The reason was that these products were partly based on RMBS and RMBS was mainly made of subprime MBS. When the subprime mortgage market collapsed CDOs lost a lot of their value, which also happened with RMBS. Because RMBS lost their values CDOs were also decreased in value (Jacobs, 2009).

2.2.5: Asset-Backed Commercial Paper Conduits

Commercial paper that is collateralized through several securities is called asset-backed commercial paper (ABCP) (Adrian. T., 2012). The entities that issue ABCP are conduits or special investment vehicles (SIVs) and they both get credit ratings for the issuance of commercial paper (Adrian. T., 2012). Commercial paper is a security of short-term funding that is issued by for example a company that needs funds, obtained from investors that buy commercial paper (Berk, 2012). SIVs are financial institutions that are specialized in maturity transformation (Pozscar, 2010). Maturity transformation could for example be described as the use of deposits, as short-term financing, to finance long-term loans that are supplied by a financial firm like a bank (Pozscar, 2010). The assets of SIVs consists of asset-backed securities (ABS), collateralized debt obligations (CDOs), mortgage-backed securities (MBS) or other forms of financial debt (Adrian. T., 2012). To fund these assets, ABCP is issued (Adrian. T., 2012). The first created SIV in 1988

transferred ABS from the balance sheets of Citigroup to its balance sheets, that is, to the balance sheets of the SIV itself (Adrian. T., 2012). ABS are claims on pooled loans, mortgages and receivables which are collateralized (Adrian. T., 2012). The income from ABS is structured into tranches, which are different risk classes of the underlying claims (pooled loans) with credit ratings. Some SIVs are highly connected with banks and operate for those banks while others operate more independently for institutions (Adrian. T., 2012).

The most important function of ABCP conduits or SIVs is to offer low costs of funding to for example a company that needs funds compared to commercial bank loans. Converting underlying assets into commercial paper, like car loans and mortgage loans, provide more funds by one security to borrowers like companies. ABCP also provides short-term funding for companies or investors that need funds in short time, compared to for example government bonds with a maturity date of 5 till 10 years (Durrer, 1997).

The market for ABCP collapsed and triggered the financial crisis of 2007 and 2008. SIVs were also heavily involved in the purchase and trade of CDOs. All these CDOs, held by SIVs were partly based on subprime MBS and residential mortgage-backed securities (RMBS) and during the collapse of the market for CDOs panic started in the market for ABCP. The reason for this panic was asymmetric information, caused by the complexity of the construction of ABCP, as a result, investors did not know the complex structure of their investments, named ABCP. Another reason for the contribution of SIVs and ABCP to the financial crisis was that some SIVs were created not only by commercial banks, but also through investment banks and therefore negative effects in the CDO market were not only on a particular sort of financial institution, but on several commercial banks and investment banks together (Lysandrou, 2015).

2.2.6: Credit default swaps

Credit default swaps (CDSs) are credit derivatives that represent insurance contracts with a protection buyer and seller (Kiff, 2009). A CDS transfers credit risks of reference entities and it provides protection to buyers of assets (which is the reference entity) against unexpected credit events of the reference entities in the case of default risks (Kiff, 2009). A reference entity could be a financial firm like a bank that issued a bond to some investor (Bodie, 2014). This bank could default on its interest payments that it must pay to its bondholder, the investor of this bond (Bodie, 2014). The protection buyer pays periodic fees to the protection seller, which is the seller of the CDS contract (Kiff, 2009).

The only function of a CDS is the transfer of credit risk which is done by providing insurance during credit events (Kiff, 2009). Some examples of credit events are: bankruptcy, failures to pay and restructuring in the case of financial distress from the reference entity (Kiff, 2009). In the case of a credit

event, CDSs could be settled in two ways, physically and by cash (Fabozzi, 2014). Physically means that the reference obligation must be delivered to the protection buyer (Fabozzi, 2014). For example, when an investor buys CDSs on a bond, issued by Goldman Sachs, and their counterparty defaults on the coupon payments, delivery of this bond by the protection buyer to the protection seller in exchange for cash must take place (Fabozzi, 2014). When settlement takes place by cash payments then a predetermined fixed amount is paid by the protection seller to the protection buyer, in the case of a credit event (Fabozzi, 2014). There is also a possibility that the payment is determined by the decline in market value of the reference obligation, in the example the bond that is owned by the investor (Fabozzi, 2014).

Many researchers stated that credit default swaps (CDSs) have contributed to the financial crisis of 2007 and 2008 (Stulz, 2009). One of the reasons is that these derivatives are traded unregulated which means that no supervisory entity that supervises and regulates the financial markets had insight in the risks that were involved in these markets (Stulz, 2009). Another reason is that CDSs involve counterparty risk (Stulz, 2009). Counterparty risk is the risk that one of the two parties of this derivative contract defaults on its obligations (Stulz, 2009), which was the case at The American International Group (AIG) in the U.S. that sold a lot of these derivatives but couldn't eventually pay all their obligations at the start of the crisis when the subprime mortgage market collapsed (Sjostrum W.K., 2009).

The part that follows next will provide some examples of financial innovations in the financial markets. The first example represents a historical account in the period before the crisis about the collateralized debt obligation (CDO). The second example will provide some information about the credit default swap (CDS) business at The American International Group (AIG), a large U.S. insurance company. The goals of these two examples is to provide a concrete overview that makes the reader familiar with the working of financial innovations in the financial markets.

2.3: Financial Innovations: examples

Example of the collateralized debt obligation: a historical account

Collateralized debt obligations (CDOs) produced in the 21st century were made to transform the mortgage market and created a source of new demand for lower-tranches of the mortgage-backed securities (MBS). Despite of the high returns of CDOs lower tranches were hard to sell to investors because of the high risks of default. The solution was there: Wall Street created the investor. Tranches that were hard to sell were built into new securities like cash CDOs backed by MBS, called asset-backed security CDOs (ABS CDOs). Many bankers packaged lower rated tranches with BBB ratings and tranches with A ratings, bundled them together and created a new security, the CDO as investment for investors. The created CDOs consisted 80% of triple A ratings while they also consisted of lower rate tranches. This product could be used as investment where risk averse investors got paid first and thereafter the more risk seeking

investors. New securities that consisted with pooled BBB rated MBS got triple-A ratings from the rating agencies, which was unusual during that time. Mathematical techniques made this possible (The financial inquiry commission, 2011).

Bankers argued that when MBSs are pooled in new securities, diversification effects could be created. Rating agencies agreed with this reasoning and provided triple A ratings to these CDOs (The financial inquiry commission, 2011). Rating agencies believed that losses in MBSs should most of the time not result in losses for the second security, as another tranche within the CDO, at the same time. They also believed that when losses were limited only investors that invested in bad rated securities would lose money while other investors that invested in higher rated securities still got paid. It was now that the CDO machine grew to a billion-dollar business industry and they became very popular. During the period between 2003 and 2007 $4 trillion of MBS were issued and Wall Street created for $700 billion ABS CDOs when the housing prices rose by 27% (The financial inquiry commission, 2011).

Demand in the market for securitizations based on mortgage loans rose quickly and the CDO was "the product" that created a mortgage supply chain. Scott Eichel at investment bank Bear Stearns as senior manager stated in an interview to financial journalists of the financial crisis inquiry commission (FCIC): "the CDO was a machine" and this machine keeps on the going, within the mortgage market. Underwriters of investment banks, CDO managers created and sold CDOs, rating agencies rated those products with a triple A rating and the guarantors, like the AIG collected fees based on the sale of CDOs, and provided credit protection against defaults. As result, investors invested a lot in ABS CDOs (The financial inquiry commission, 2011).

The first CDO, which was issued in 1987 by Michael Milken's Drexel Burnham Lambert, was created from different junk bonds of companies. The strategy was to pool many bonds because, due to diversification, it reduced investors exposures to the failure of those bonds. When the CDO was created, many investors had the possibilities to pick their degrees of risks and returns. After the liquidity crisis of 1998 many CDOs were created and backed by asset-backed securities (ABS). ABS were backed by auto loans, mutual fund fees, mobile home loans and mortgages. The heterogeneity of asset classes provided layers for safety to investors. These so-called multisector CDOs performed poorly in 2002, but many investors, investment bankers and rating agencies had the wisdom that bad performance was due to the wide range of asset classes used to construct CDOs and that CDO managers didn't had the skills to specialize in some sectors of those asset classes that were backed by multisector CDOs. At that time, the non-prime MBSs were selected to construct CDOs. CDO managers were convinced that they had the skills to provide reasonable products (CDOs) based on MBS (The financial inquiry commission, 2011).

CDOs became popular at that time, which were based on mortgage loans. Investment banks liked increased investor demand of these CDOs they had created and investors liked the safety and returns of these CDOs. In 2004 CDOs consisted for more than a half of MBS as collateral. Sales of CDOs rose from $30 billion to $225 billion in the period of 2003 till 2006, and sales doubled every year. The key players that participated at the CDO market are security firms like investment banks, investors, rating agencies, CDO managers and financial guarantors. Investment banks underwrote the CDOs and sold them to investors. The three investment banks, Merrill lynch, Goldman Sachs and Citigroup had a portfolio of more than 30% of all CDOs. Investment bank UBS and Deutsche Bank were also major CDO players. "Sales were everywhere" said Nestor Dominguez, co-head of the CDO desk at Citigroup to the FCIC (The financial inquiry commission, 2011).

Rating agencies gave triple A ratings to CDOs, which made these products good investments for many investors. CDO investors were mostly focused on different tranches which were based on their resultant risk and return profiles. Equity tranches were at most popular under hedge funds. Some CDOs were important for investors because of their mezzanine tranches. Sales of CDOs with mezzanine tranches, with ratings of A and BBB increased rapidly. CDOs with 80% or 100% of their cash invested in other CDOs called CDOs squared. Issuers in the credit derivative markets like AIG sold CDSs to investors to guarantee their CDO investments in the case of a default. The issued swaps were based on the CDO tranches, which resulted in more investor demand for CDOs. The reason for this is that CDSs made CDOs risk-free investments with reasonable returns. The rapid growth of CDOs bid up the prices in the traditional market for MBS and became a substitute for saver investments (The financial inquiry commission, 2011).

The American International Group: "The golden goose for the entire street"

The largest insurance company in the world, measured in 2004, called The American International Group (AIG) which had asset worth of $850 billion and 116,000 employees which work in 113 countries worldwide. Rating agencies made the business of AIG because this company was highly dependent on its ratings. Ratings create the possibility that AIG could borrow at low costs and use this money for lucrative investments (The financial inquiry commission, 2011).

To use the benefits of its ratings AIG saw the opportunity to become a major dealer in credit default swaps (CDSs). In 1998 AIG starts selling CDSs to investors and financial institutions to guarantee collateralized debt obligations (CDOs). AIG gave insurance protection in the case of CDO defaults against paid fees. Fees that were paid by investors and financial institutions for credit protection were huge profits for AIG

and therefore they became even more specialized in the sales of CDSs (The financial inquiry commission, 2011).

Banks that bought CDSs could hold more capital on their balance sheets because they were protected against credit risks, which in turn increased their lending even more. In the year of 2005 AIG had written CDSs worth of $107 billion mostly to European banks. CDSs could be insurance policies and insurance companies normally need to hold some provisions in case of losses, but CDSs were not regulated and therefor AIG didn't need to hold provisions on its balance sheet (The financial inquiry commission, 2011).

In the year of 2007 AIG sold CDSs worth of $379 billion. AIG sold CDSs on CDOs with tranches that were valued from $2 billion in 2002 to $54 billion in 2005. The biggest customer of AIG was Goldman Sachs which was specialized in CDO underwriting. But AIG also sold for billions of dollars to Merrill Lynch and Société Générale. The business of AIG kept growing and it sold not only CDSs on CDOs, but also on bonds and mortgage-backed securities (MBS) (The financial inquiry commission, 2011).

Managing director Gene Park at AIG financial products said to the FCIC that AIG was the best player in structured risk-free transactions against a small premium. Gene also said that they were the only company that can do that. The business of AIG in CDSs based on CDOs and MBS grew fast, which grew from $22 billion to $577 billion in the period between 2002 and 2007. AIG financial products represented these businesses by operating incomes of $4.4 billion in 2005 which was 29% of AIG's total income. The fees of AIG from the sale of CDSs were 0.12% on every notional amount of the CDS per year (The financial inquiry commission, 2011).

3: Consequences of Financial Innovation

This part will describe the three most important consequences of financial innovation which are argued in this research as 'the determinants' of the causal relationship between financial innovation and the financial crisis. Excessive risk taking, asymmetric information and failed corporate governance systems are described in this research as 'the consequences' of financial innovation. The consequences of financial innovation will be analyzed on two levels. The first level analysis describes the consequences as 'independent determinants' that links financial innovation as the responsible factor for the financial crisis. The second level analysis describes the consequences as 'dependent to each other' to determine the causal relationship between financial innovation and the financial crisis.

The first level analysis about the consequences of financial innovation will be described as follows. The first consequence to be described will be excessive risk taking by 'the investment bank's decision

makers', induced by a strong bonus-driven culture (Crotty, 2009). The second consequence of financial innovation is described as the creation of disproportionate asymmetric information that confronts the decisions of investors (Orlowski, 2008). The last consequence will be described as corporate governance failure that is represented by a misunderstanding of risks associated with collateralized debt obligations (CDOs) (Kumar, 2013).

When the three most important consequences are analyzed as determinants to each other, which is also for the determination of the direct responsibility of financial innovation to the financial crisis, the analysis will be different. This means that the direct responsibility of financial innovation for the financial crisis will be analyzed by excessive risk taking, asymmetric information and failed corporate governance systems as 'dependent' on each other. In this case, excessive risk taking by business line managers is caused by asymmetric information from complex financial products like CDOs as result of failed corporate governance systems in financial firms (Jagtiani, 2010).

The reason for doing a two-level analysis is the believe that these three consequences also depend on each other. Corporate governance states that the board of directors are responsible for adequate and effective risk management systems to provide protection against excessive risk taking (Kirkpatrick, 2009). When this fails excessive risk taking and a misunderstanding of the risks associated with complex financial products will be the result (Schwarcz, 2009). These problems together have contributed to the financial crisis of 2007 and 2008 (Kirkpatrick, 2009). More important is that there is a relationship between corporate governance systems, excessive risk taking and asymmetric information as the consequences of financial innovation, that determine the causal relationship between financial innovation and the financial crisis, which is the reason to provide a two-level analysis in this research by a literature review (Jagtiani, 2010).

The goal of this literature review is to provide evidence that indeed the consequences of financial innovation caused the financial crisis of 2007 and 2008. Therefore, all these consequences will be explained in detail to provide a detailed view on 'what' has caused the causal relationship between financial innovation and the financial crisis.

3.1: Excessive Risk Taking

Investment banks, commercial banks with investment banking activities, investment funds, insurance companies and rating agencies could all be described as 'bonus-driven compensation culture' that promotes excessive risk taking. For example, credit rating agencies are blamed for their behavior that is described as providing high quality ratings to 'high-risk' credit risk-shifting instruments like collateralized debt obligations (CDOs), mortgage-backed securities (MBS) and residential mortgage-backed securities

(RMBS). The result of their actions is that investors and other financial firms like banks who bought these securities, didn't know the involved risks of these complex financial products, which were presented by the underlying subprime mortgage loans (Crotty, 2009).

The business culture of investment banks is described as highly bonus-driven and transcends to other bonus cultures of other financial firms like insurance companies (Crotty, 2009). Investment banks are described as financial intermediaries that facilitate in the delivery of financial information about potential firms, based on their growth estimates for the future, for investments in their businesses by investors (Morrison, 2007). Compared to commercial banks, which serve as savings institutions for savers and borrowing institutions for households or companies, investment banks are more specialized in providing funds to companies and investors that participate within the financial markets (Morrison, 2007). Among all the afore-mentioned financial firms, investment banks were at the center of the trade in 'high-risk credit risk-shifting instruments' like CDOs, RMBS and credit default swaps (CDSs) (Crotty, 2009). They paid their employees high bonuses even at times when the banks performed poorly (Crotty, 2009). Bonuses should be paid in good times, when the bank performs well and should be reduced at times of economic downturns and whenever the bank performs poorly (Crotty, 2009). This theory highlights the positive relationship between bonuses and performance within financial firms. (Crotty, 2009) But at investment banks one could speak of a 'bonus-performance gap', because bonuses in these organizational cultures were not coupled to their performance at all (Crotty, 2009). During good times, when investment banks performed well the bonuses at investment banks were large, but during bad times, when investment banks performed poorly, these bonuses were even larger, hence a convex bonus-performance gap (Crotty, 2009). For example, investment banks like Goldman Sachs and JP Morgan and Chase Manhattan paid large bonuses to their employees, during the financial crisis of 2008, the total of it being larger than these banks net income (Crotty, 2009). Investment bank Merrill Lynch paid bonuses of about $15 billion in 2007 and lost $7 billion during the financial crisis, but paid in the year of 2008 for at least $16 billion as bonuses to its employees (Crotty, 2009). Bonus-driven compensation schemes at investment banks were convex, they had infinite gains and no reduction incentives at all (Crotty, 2009).

Excessive risk taking at investment banks, induced by bonus-driven compensation schemes, which was mainly based on the trade of dysfunctional credit risk-shifting instruments like CDOs and RMBS made financial innovation responsible for the financial crisis (Crotty, 2009).

3.2: Asymmetric Information

One contributing factor to the financial crisis is asymmetric information caused by financial innovations that hampered investor decisions (Orlowski, 2008). Asymmetric information is described as the advantage of information between certain people. It states that some people are better informed than others and know

more about a certain good or situation than others (Mankiw, 2011). This advantage of information will influence the decisions made by the better-informed people, that is, when people are better informed they will act on this informational advantage (Mankiw, 2011). Asymmetric information will lead to hidden action or hidden characteristics (Mankiw, 2011). An example of a hidden action is that an employer knows less about the effort of his workers on the job, which means that the workers have informational advantage about their effort that they put in their jobs (Mankiw, 2011). Hidden characteristics could happen with trades (Mankiw, 2011). For example, when a seller of a car hides relevant information for a car buyer like for example the real costs of reparation when the car has a breakdown (Mankiw, 2011).

Financial innovations like MBS have lengthened the distance between mortgage borrowers and investors of mortgage-backed securities (MBS) (Orlowski, 2008). This distance is caused by the process of securitization (Gorton G. M., 2012). Securitization is the process of purchasing loans by a special purpose vehicle (SPV) (Gorton G. M., 2012). The SPV pools these loans and sell them together under a new security to investors in the financial markets (Gorton G. M., 2012). MBS is one example of such a new security, which is made of a pool of mortgage loans (Acharya, 2009). This enlarge the gap between borrowers that uses these loans and investors that invest in these new securities like MBS (Orlowski, 2008). The real problem was that the distance between the mortgage borrowers and investors of MBS was represented by hidden risks of default (Orlowski, 2008). This is exactly what asymmetric information implies, namely that the creators of financial innovation are better informed about these MBS then investors were (Mankiw, 2011). Thus, the hidden risks of default were only known by the creators of MBS (Orlowski, 2008).

Another thing to notice is that the yield spread between the market risk of structured products like CDOs and the risk-free rate of risk-free securities did not compensate for the hidden risks of these securities, which is the result of adverse selection problems for investors (Orlowski, 2008). Adverse selection is described as the problem of a financial institution, for example a bank, that knows less about the risk profile of investors than investors do (de Haan, 2015). The risk profile of investors is described as the amount of risk that investors are willing to take for their investments (Bodie, 2014). This results in the supply of less or more attractive securities to investors (de Haan, 2015). The reason for this is that banks, because of their available information about investors, could only base the price of those CDOs on a more aggregated market price that is based on the demand of CDOs by the entire financial market (de Haan, 2015). In this case the bank provides less compensation for CDOs to investors then they ‘should’ earn (de Haan, 2015). To be summarized, because of the problems of adverse selection, when financial institutions know less about the risk profiles of investors for CDOs, investors were not compensated for the ‘hidden risks’ that were involved in these CDOs (de Haan, 2015). This is also a form of asymmetric information,

namely the bank knows less about the risk profiles of investors, which led to the problem of adverse selection, which resulted in the fact that investors were not compensated for the hidden risks of the CDOs (Mankiw, 2011).

3.3: Corporate Governance Systems

Failed corporate governance systems is one of the most important causes of the financial crisis, which caused by financial innovations (Kumar, 2013). To see why this is possible the reason for this will be discussed. The reason that financial innovations led to failed corporate governance systems is the failure by the board of directors from investment banks to understand the risks that were associated with complex structured products like CDOs (Kumar, 2013). The reason for this failure is the fact that they failed to guide strategies and implement effective risk control procedures (Kumar, 2013). Risk control activities could be described as practices that resulted from policies and procedures that provided assurance that the risk responses of the bank were carried out (Kirkpatrick, 2009). Risk responses are the set of actions taken by management that is focused on the risks that reflect the company's risk tolerance and risk appetite (Kirkpatrick, 2009). Risk appetite is described as the accepted amount of risk that an organization is willing to take to achieve its goals (Romney, 2012). To understand the failure of corporate governance the definition and principles of corporate governance will be explained below.

Corporate governance goes about suppliers of finance in corporations that try to assure themselves for the return on their investments. When the above definition of corporate governance is viewed through the perspective of banks, governance is more focused on opaqueness and government regulation, compared to non-bank and other organizations. The definition of corporate governance for banks is therefore described as the way in which equity and debt holders stimulate managers of banks to act in the best interests of these providers of capital (Polo, 2007).

The principles of corporate governance from OECD represents guidelines for market participants, policy makers and regulators to improve the institutional, regulatory and legal framework that supports the implementation of corporate governance systems. OECD provides practical guidance and advise to stock exchanges, investors and corporations that could benefit from good corporate governance systems. One principle of corporate governance, based on the area of board responsibility states that: *the framework of corporate governance must assure strategic guidance for the corporation, monitoring of managers by the board of directors and accountability to the shareholders and the corporation* (Jesover, 2005).

3.4: Failed Corporate Governance Systems: A lack of Transparency and Risky Bets

Financial innovation made it possible for business line managers at financial firms to make huge bonuses by the increasing investments in structured financial products like CDOs because they gained from the

products ‘lack of transparency’ (Jagtiani, 2010). CDOs were less transparent then for example government bonds because of their complexity (Lysandrou, 2015). This complexity was caused by the heterogeneity of the CDOs underlying asset classes (Lysandrou, 2015). CDOs compared to asset-backed securities (ABS) have a wide range of asset classes, used in their construction (Lysandrou, 2015). This means that CDOs are made of more underlying products like subprime backed securities and prime ABS which are securities based on subprime and prime mortgages (Lysandrou, 2015). ABS are constructed by one asset class like for example residential mortgage loans, as ‘the only’ underlying asset class (Lysandrou, 2015).

The incentive of business line managers at financial firms was to increase profitability from complex structured financial products because they promoted risky positions that looked like safe and profitable investments (Jagtiani, 2010). It gave them the possibility to increase their bonuses by taking huge exposures that were ‘unchecked’ by senior management or the board of directors of these financial firms (Jagtiani, 2010). Only ‘the business line managers’ knew that the profits from complex financial products were exposed to the subprime mortgage market (Jagtiani, 2010). The subprime mortgage market is the market for subprime mortgages which are mortgages that were sold to people with high risk of default and played a key role in the financial crisis (Acharya, 2009). Many complex financial products like CDOs were made of underlying securities that were mainly based on subprime mortgages (Acharya, 2009).

If senior management had less information about the true riskiness of these structured financial products then there is a difference in the knowledge of information about these products (Jagtiani, 2010). This problem is called asymmetric information, which means that some people have more information about certain goods than others (Mankiw, 2011). The fact that some people are better informed about goods than others, decisions made by the better-informed people are always based on this information advantage (Mankiw, 2011). This phenomenon was exactly the case in financial firms where business line managers were better informed, compared to senior management, about the risks that were associated with complex financial products, that were based on risky subprime mortgages (Jagtiani, 2010). Business line managers therefore decided to take huge risks in these products because they knew that these risks are not seen by senior management (Jagtiani, 2010).

The reason for this behavior of the business line managers at financial firms, which was one of the causes to the financial crisis, is failed corporate governance. Failed corporate governance is described by failed risk control systems. The reason for the failure of risk control systems is that these systems were not designed to foresee the excessive risks that existed in the mortgage market for subprime mortgages. But why had corporate governance failed at large financial firms? The failure of corporate governance is caused by the too-big-to-fail policy of the government that encourage loose risk controls at big financial

firms. The policy for financial firms that are too-big-to-fail was to provide a government subsidy to those firms, like big banks or insurance companies that decreased their incentive for high risk-taking behavior. But instead of promoting effective risk controls at large financial firms, problems of moral hazard described here 'as the increase' of taking huge risks that provide large profits, was represented by failed corporate governance systems. Thus, the policy for financial firms that are too-big-to-fail did not promote effective corporate governance systems, which led to excessive risk taking by business line managers that have benefit from asymmetric information from complex financial products (Jagtiani, 2010).

Excessive risk taking that was done by business line managers who profit from asymmetric information and lax corporate governance systems has contributed to the financial crisis of 2007 and 2008 (Jagtiani, 2010).

4: Two case studies on the consequences of financial innovation during the financial crisis of 2008

In this part two case studies will be described. The first case highlights the collapse of the chain of securitization, that is described as all the financial institutions that were involved in the securitization of securities and the trade of those financial innovations like credit risk-shifting instruments. The second case describes the risky business of the American International Group (AIG). The goal of this research is to analyze the causality between financial innovation and the financial crisis of 2007 and 2008 which is done by literature review.

The reason to analyze the causality between financial innovation and the financial crisis by two case studies is to provide a more concrete analysis by the study of the real situation of financial firms during the financial crisis. Literature review has a more theoretical perspective on the consequences of financial innovation whereas the case study studies real life situations at financial firms that played a major role in the trade and construction of financial innovations.

In this research, a descriptive case study will be done. This type of case study studies issues in a real-life context. The goal of this research is to study the real-life situation at financial firms for the determination of the causality between financial innovation and the financial crisis. A descriptive case study meets the afore-mentioned goal of this research (Baxter, 2008).

One advantage of doing a case study is that it gives the possibility to answer how and why questions. This research wants to analyze the responsibility of financial innovation for the financial crisis by how and why questions. Financial innovation creates excessive risk taking, asymmetric information and failed corporate governance systems which are all 'how questions' for the determination of the responsibility of financial

innovation for the financial crisis. Why questions are analyzed in this research by the fact that this research studies why these financial innovations have contributed to the financial crisis (Baxter, 2008).

Another advantage of conducting a case study is that cases study situations where the behavior of the financial firms and investors cannot be manipulated. In this case, the financial crisis and the creation of financial innovation has already happened. This research wants to study the situation that led to the financial crisis just as the way it was, that is, from a historical account (Baxter, 2008).

One disadvantage of conducting a case study is that it is difficult to report a case in a concise manner. The difficulty of this research is to report the consequences of financial innovation from the two case studies because financial innovations are quite complex phenomena. The consequences of financial innovation are complex to analyze because there are many parties involved. What causes what is the question when analyzing these case studies. This makes it difficult to report the consequences of financial innovation in such a way that the reader fully understands that these consequences indeed were instrumental in making financial innovation responsible for the financial crisis of 2007 and 2008 (Baxter, 2008).

Another disadvantage of conducting a case study is that it is not a methodology and therefore the choice of the case to be studied may influence the outcome in a disproportional way (Creswell, 2007). To dampen this effect this research included two case studies of different entities.

The first case will go about the problems of financial innovations in the chain of securitization, which includes all markets and institutions for the process of the design of financial innovations (Guttman, 2011). The second case will highlight the problems of innovations at The American International Group (AIG).

4.1: Breakdown of the Chain of Securitization

Introduction

Financial innovations are almost always constructed by a chain of institutions and markets that are all involved in its construction and investments (Fabozzi, 2014). Examples of institutions are special purpose vehicles (SPVs) and conduits that create ABCPs but also investment banks that originate and trade those innovated products (Guttman, 2011).

The Case: Failure by The Chain of Securitization

When BNP Paribas announced its failure of two managed investment funds panic started in the financial markets which resulted in panics that were system wide, through the whole chain of securitization. The reason for this was the inability of accurate pricing of securitized securities like collateralized debt obligations (CDOs) that lost a lot of their real market value, based on that current situation, the start of the

financial crisis of 2008. As result, there was nobody who knew the real value of those securities (Guttman, 2011).

When securities are impossible to price, there is also an inability to trade or use them as collateral. The result of this phenomena was a market for mortgage-backed securities (MBS) that became unbalanced because it dried up. This in turn resulted in problems within the market for credit risk transfers, the CDO market. The market for CDOs was frozen during the financial crisis because defaulted subprime mortgages devalued MBS and this decreased the trustworthiness of those CDOs. CDOs lost for about 80 percent of their trading volume, because they were difficult to value and therefore hard to monitor during the financial crisis (Guttman, 2011).

After problems in the CDO market many financial institutions, like investment banks were exposed to huge write downs. Merrill Lynch and Citibank had for $8 and $11 billion losses on CDOs by the end of October 2007. They had a portfolio value of subprime CDOs, which were CDOs backed by subprime mortgages for at least $1 billion. Also, credit rating agencies like Standard & Poors and Moody's started to downgrade CDOs which resulted in many sales of those products by investors that invested in these securities. The process of debt-deflation in these markets was started (Guttman, 2011).

Despite the huge losses of investment banks on subprime CDOs also insurance companies and pension funds faced huge losses, which was caused by their devaluations from CDO downgrades. This was also the case for hedge funds that used CDOs as collateral for their leveraged games. When CDOs reduced the value of the hedge funds assets they sold their assets immediately to meet its debt obligations. The same problems were also the case at private equity funds that used CDOs to finance their investments (Guttman, 2011).

All these CDO write downs rolled over to the market for asset-backed commercial paper (ABCP). The shut down on the market for ABCP decreased possibilities in short term funding for banks which was usually provided by private equity funds to provide leverage to their businesses. The commercial paper market came under high pressure during the year of 2007. Because of these problems banks had a lot of liquidity requests that were caused by the loss in confidence of investors. Banks were not troubled only by their own management of balance sheets but also to the balance sheets of their created ABCP conduits and SPVs that were used for the origination and management of CDOs. In the end central banks, like the Federal Reserve bank stepped in to provide funding to prevent more problems in these markets (Guttman, 2011).

These problems in the markets for securitization became a worldwide phenomenon, not only for the financial system but also for the real economy in the United States (U.S.) which was seen in many areas,

like the area of job creation, productivity and sales in the retail sector. Also, house owners saw their houses decrease in value because their value of equity that served as collateral of their homes declined below their obligations, their outstanding debt (mortgages). Also, the mortgage market faced large losses which resulted in declined sales of prime mortgages (Guttman, 2011).

Banks were less able to securitize mortgages, because they did not only experienced large losses but they also tightened their credit standards for providing more mortgages to households in general (Guttman, 2011).

4.2: The Bailout of AIG

Introduction

This case goes about financial distress, faced by one of the largest financial institutions in the world, The American Insurance Group (AIG) which was one of the big problems during the financial crisis of 2008. AIG collapsed because its businesses of credit default swaps (CDSs), worth of at least $500 billion came to a halt when this institution was troubled and not able to meet its obligations that caused by huge sales of CDSs. This case explains the AIG businesses of CDSs, asset-backed securities (ABS), tranching, securitization, collateralized debt obligations (CDOs) into a systematic analysis that is based on the problems at AIG, which is necessary to understand the process of failures in the CDS portfolio (Sjostrum W.K., 2009).

The first part of this case gives a short general overview on the type of company, like its operations in general and specific its operations in CDS businesses. Thereafter problems at AIG in 2008 due to CDSs are described detail for a good understanding of the consequence of financial innovation, that is the consequence of CDSs on a financial holding company.

The Case: Bailout of The American International Group

AIG is a financial institution, a holding company that is specialized in insurance and insurance-related services and products and its base country is the United States (U.S.) but they have also businesses across the world. The company is listed on the New York Stock Exchange and it operates in more than 130 countries, with half of its revenues from its foreign operations. The business units of AIG are General Insurance, Retirement Services and Life Insurance, Asset Management and Financial Services. CDSs were sold in the Financial Service unit of this holding company (Sjostrum W.K., 2009).

AIG operated CDS businesses by its subsidiaries, named AIG Financial Products Corp. and AIG Trading Group Inc., and AIGFP which are respective subsidiaries. AIGFP's CDSs were sold mainly on super senior risk tranches which is based on a basket of pooled loans and ABS. Senior tranches are risk classes

that belongs to investors are paid first, followed by the mezzanine and junior tranches. Senior tranches could receive triple A and one could say that the CDS business of AIGFP was a save business. AIGFP sold credit protection, by CDS to make money, received from the paid premiums of CDSs (Sjostrum W.K., 2009). But how could a company like AIG with assets worth of almost $1 trillion and shareholders' equity of at least $95 billion suddenly in financial distress?

The collapse of AIG is mainly caused by its CDS businesses, which were written on multisector CDOs by the subsidiary AIGFP. A multisector CDO has the same principle as the traditional CDO but its underlying assets, ABS tranches are based on different financial products, like residential mortgages, commercial mortgages, credit card loans etc. The problem was that AIGFP has also written CDSs on CDOs that were based on residential mortgage-backed securities (RMBS), which consisted of subprime mortgages. These transactions were worth of at least $61 billion, which represented the value of their CDS portfolio at that time (Sjostrum W.K., 2009).

During the summer of 2007 the residential mortgage market in the U.S. came into trouble because people that owned subprime mortgages began to default on their loans. These problems expanded rapidly to the businesses of AIGFP and resulted in huge write downs at AIGFP for at least $11 billion in its CDS portfolio. This amount increased in the year of 2008 to almost $20 billion. The problem was that special purpose vehicles (SPVs), that sold those multisector CDOs, got into trouble because the cash flows that it normally received defaulted. This in turn had a negative effect on the quality of the issued securities from the SPVs, and in the end, this damaged the quality of the multisector CDOs, that were bought by some SPVs. Notice here that is told that multisector CDOs consists of ABS tranches, and ABS tranches are issued by SPVs. These problems increased the CDS spread (is premium paid by the protection buyer of the CDS), written on CDOs, which resulted again in more losses of the CDO CDS portfolio of AIGFP. But this was not the main cause that AIG collapsed (Sjostrum W.K., 2009).

The major cause of financial distress at AIG were collateral postings on multisector CDOs, which were obligations for AIGFP from the CDO CDS portfolio. The amount of paid collateral depends on the terms of provisions, paid by the protection buyer to insure itself against default risks. Many CDSs that were based on multisector CDOs had requirements of collateral postings on the difference between the notional amount of the CDS and the market value of the CDOs. When CDOs during the year of 2008 decreased in market value AIGFP paid a lot of collateral for a value of at least $6 billion. AIG became troubled after these credit events and faced cash runs and was therefore unable to meet its daily cash needs for its operations (Sjostrum W.K., 2009).

Another problem at AIG that contributed to its cash problems had to do with its securities lending program that was issued by AIG institutional asset management. AIG had loaned securities of its investments, like for example bonds lend to other financial institutions in exchange for collateral in cash, that was posted by the borrower, in this case the other financial institutions. Why borrowed all those financial institutions securities from AIG? This is easy to imagine, they were mainly engaged in short selling. AIG loaned securities for at least $75 billion and became dominant in this business. AIG investments used the proceeds of cash collateral for investments in debt securities that earned a return that served as a substitute for the lending securities to other financial institutions. But when investors got the news about AIGs write downs they became worried of their posted collateral at AIG investments. But AIG had invested almost all the proceeds of the collateral in RMBS that decreased rapidly in value and in liquidity. As result, AIG defaulted on its obligations that were all based on its posted collateral. Again, AIG had to pay their obligations to its borrowers for at least $3 billion (Sjostrum W.K., 2009).

When AIG realized that its cash position was at its worst level they became very optimistic and increased their efforts to make extra money, that is, they tried to raise more capital. For these purposes, they tried to make deals with investors, foreign wealth funds and several private equity firms but no deal was reached in the end. Another problem that arose in 2008 was from AIG subsidiaries that could not meet their obligations in the commercial paper market. They were unable to provide commercial paper financing which resulted in a shut down from the commercial paper market (Sjostrum W.K., 2009).

After all these events, written downs of AIGs CDS portfolio, its inability of access to commercial paper markets and problems of its lending program to other financial institutions led to downgrades of rating agencies, like Moody's, Standard & Poors and Fitch. These downgrades resulted in more obligations for AIG like the post of more collateral to AIGFPs CDSs. AIG tried to make a last deal with Goldman Sachs, J.P. Morgan and The Federal Reserve Bank of New York for a lending program but unfortunately no one agreed, which resulted in financial distress at AIG. Eventually the U.S. government decided to save AIG to prevent a bankruptcy of almost the biggest financial institution in the U.S. and the rest of the world which was all caused by financial innovations based on subprime mortgages (Sjostrum W.K., 2009).

5: Conclusion

In this research risk-shifting innovations, specific credit risk-shifting instruments are analyzed to determine their role in the financial crisis. This research tries to answer the question about whether excessive risk taking, asymmetric information and failed corporate governance systems determine the causal relationship between financial innovation and the financial crisis of 2007 and 2008.

Financial innovations like credit risk-shifting instruments turned out to be weak instruments, when their underlying products became dysfunctional, in this case subprime mortgage loans, resulting in problems for many financial firms and investors through the whole financial system and could be described as the cause of the financial crisis of 2007 and 2008. Credit risk-shifting instruments should have the benefit that they shift away the credit risk to investors that want to bear them. So how is it possible that these credit risk-shifting instruments like mortgage-backed securities (MBS), collateralized debt obligations (CDOs) and credit default swaps (CDSs) lead to the financial crisis? This research has found the following findings.

The first finding in this research states that excessive risk taking is caused by bonus-driven compensation schemes in the organization cultures of investment banks. These firms paid bonuses not only during times of good business performance but also during times of poor business performance. Notice that bonuses during times of bad performance of investment banks were even higher than their net income and higher than the bonuses paid at times of good performance, hence a convex bonus-performance gap. Excessive risk taking was represented by the intensive trade in credit risk-shifting instruments, but when these instruments lost their value after the collapse of the U.S. mortgage market, problems came true in their businesses. Many investment banks had huge losses by write downs of CDOs and residential mortgage-backed securities (RMBS) and thus triggering the crisis.

The second finding states that financial innovations create asymmetric information. Investors didn't have enough information about the real risks that were associated with MBS, CDOs and other credit risk-shifting instruments. Asymmetric information is mainly caused by the complex build ups of these products, because these products are compounded from many underlying securities or pools of loans. MBS are created by underlying pools of mortgage loans but CDOs are constructed of MBS and RMBS. But when the underlying products of these securities turned out to be dysfunctional more information like downgrades of credit rating agencies of these products shocked investors and resulted in panic among them and hence the financial crisis was started.

Another important finding is that weak corporate governance systems in financial firms lead to less insight and underestimation of their exposures to credit risks, associated with credit risk-shifting instruments. One responsibility of the board of directors at investment banks is to ensure effective corporate governance systems, which is sustained by the effective implementation of risk controls. Risk controls are necessary to understand the risks that are associated with complex financial products, like CDOs. The board failed in providing accurate tools for the implementation of risk controls which was the result of lax corporate governance at these financial firms. When MBS, RMBS, CDOs, CDSs and asset-backed commercial paper (ABCP) turned out to be weak they underestimated the consequence of their weakness for the

financial health of the financial firms. In the end, when these financial firms like investment banks were on the brink of a collapse, the crisis started.

This research has also conducted a second level analysis that analyzes the consequences of financial innovation as dependent factors from each other. The main finding is that excessive risk taking by business line managers at financial firms, made possible by financial innovation, took huge risks because they had informational advantages about these complex financial products. This was possible by lax corporate governance systems that were promoted by a failing too-big-to-fail policy of governments that should have promoted effective corporate governance through subsidies. The result is that business line managers took huge risks for large bonuses, risks that were unchecked and not known by anyone else which was 'the result' of lax corporate governance systems and financial innovation in securities.

Thus, the main conclusion in this research is that when financial innovations like credit risk-shifting instruments are made of weak underlying loans, in this case subprime mortgage loans, excessive risk taking by extensive trade in these instruments by investment banks, the complexity of these instruments and lax corporate oversight of the board of directors on the risks of these products lead to a credit crisis. Financial innovation lead to excessive risk taking, asymmetric information and lax corporate governance systems that all make credit risk-shifting instruments based on subprime mortgages responsible for the financial crisis of 2007 and 2008.

Despite the benefit of credit risk-shifting instruments, like the transfer of credit risks to investors or financial firms that want to bear those risks, many problems were caused by this sort of financial innovation. Credit risks were not entirely shifted away, because when investors found out that MBS, RMBS and CDOs were toxic, caused by the collapse of the subprime mortgage market, financial firms got troubled immediately. Financial firms had to write down these instruments off their balance sheet and lost much of their financial health. The main goal for financial firms was to shift or transfer these credit risks of CDOs to other parties. This research could provide more analysis on the transfer of credit risks off credit risk-shifting instruments with different underlying products of different credit status are considered in their construction.

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