Assicurazioni Generali
RESEARCH DEPARTMENT

Systemic Risk Regulation: the Impact on Insurers' Equity Prices

2015

Paolo Zanghieri

WORKING PAPER WP1/15

SYSTEMIC RISK REGULATION: THE IMPACT ON INSURERS' EQUITY PRICES

PAOLO ZANGHIERI*

Research and Development, Assicurazioni Generali SpA

Department of Economics, University of Bologna

Email: *paolo.zanghieri@unibo.it*

This version: 3rd March 2015

ABSTRACT

This paper analyses the impact of the evolution of the regulation dealing with systemically important insurance groups, using an event study methodology. The results show that investors were able to detect which companies were to be designated well ahead of the publication of the list. Most important, after an initial positive reaction, consistent with the expectation of a "Too-big-to-fail" implicit subsidy, the disclosure on how the capital charges for systemic insurers will be calculated led to sizeable negative abnormal returns for the entities concerned. Leverage plays a key role in driving investors' reaction; more leveraged entities experience higher abnormal returns when the expectation of a TBTF guarantee arises and lower ones when information on the size of the capital charges is revealed.

JEL Classification: G20, G22, G23, G28

Keywords: Insurance Companies, Systemic Risk, Global Systemically Financial Institutions, TBTF, Too-Big-to-Fail, Capital Requirements

*The views expressed in this article reflect only the author's opinion and by no means those of the institutions to which he is affiliated. I wish to thank Dario Focarelli for useful suggestions and comments on previous drafts. All errors are my own.

1. INTRODUCTION AND MOTIVATION

In 2008, the biggest bailout in history prevented the failure of a large insurance company, AIG. This was coupled, in Europe, with quite important amounts of public money being used to rescue and recapitalise financial conglomerates with sizeable insurance activities. All this has raised the question on whether insurance companies can become an important source of systemic risk and, if so, which entities should be regulated and how. Since 2012 international regulation have come up with a new framework aimed at identify and regulate Global Systemically Important Insurers (G-SIIs). The regulation is based on stricter overseeing of the accounts and practices, the requirement for the designated companies to prepare a plan allowing an orderly resolution of the entity in case of severe distress and, above all, envisages an additional capital requirement to which G-SIIs will be subjected, the Basic Capital Requirement (BCR).

These papers seek to assess how financial markets reacted to the evolution of this regulation. In particular I try to gauge to what extent insurance companies designed as systemically important, or those who may be so in the future enjoy a "Too-Big-to-Fail" (TBTF) premium and/or whether the imposition of additional capital requirements has been perceived as burden. In order to distinguish with precision which entities are liable to fall under the new measures I exploit the different layers of regulation recently proposed for domestically and internationally active insurance groups. Following what is being done for other components of the financial industry (especially banks) I use a time-tested event study methodology.

The results show that this regulation matter to investors, as the key steps of the regulation were accompanied by statistically significant abnormal returns for the equity of the entities affected. Investors were able to identify which companies would be designed as G-SII one year and a half before the official designation, and the positive reaction to the extension of the framework for systemically important banks to insurance companies can be thought as the perception of a valuable "Too-big-too-fail" implicit guarantee, in line with what found by similar studies on the banking sector. However, when, after the formal designation, details emerge on what arguably is the most important policy measure, the Basic Capital Requirement, G-SIIs experience negative abnormal returns, which can be interpreted as a gauge of the price of the TBTF guarantee. This interpretation is corroborated by the fact that both the first – positive- effect and the second-negative-one are stronger for more leveraged entities.

The overall impact of the regulation so far is not very large, slightly below what found for banks. Considering the Group of G-SIIs, the cumulated abnormal returns of the events where they are statistically significant is 0.58%. The difference with respect of a group of insurance with similar characteristics but which have not being designated is -0.18%, indicating that, so far, the price of the TBTF guarantee is perceived as slightly higher that its value. These values, along with the results of the responsiveness of abnormal results to company characteristics, can hopefully inform the debate on the regulation and provide support for the next stages.

In Section 2 I briefly describe the cases of public bailouts of insurance companies during the 2007/8 financial crisis and sketch the new regulatory framework for global insurers which is being developed. Section 3 illustrates the differences between the banking and insurance business, the merits and limitation of a capital based regulation applied to insurance intermediaries and the evidence available so far on the TBTF premium in insurance. Section 4 summarised the methodology utilised. The results are shown in section 5 and discussed in Section 6. Section 7 concludes.

2. The Insurance Sector, The Financial Crisis and the New Regulation

The insurance sector was not spared by the global financial crisis and some groups had to be bailed out by governments or central banks. In September 2008, as a consequence of the rapidly escalating losses on its CDS portfolio, AIG, one of the largest insurers in the world had to be bailed out by the U.S. government. In September 2007 the Federal Reserve recapitalise AIG for USD 85 billion, in exchange for 79.9% of AIG equity; one year later, escalating uncertainty over the future of the company forced the central bank to pledge another USD 37.8 billion. This amounted to the largest bailout in history. On top of that, AIG was forced to sell part of its insurance business.

During the subprime crisis, apart from AIG, other large U.S. insurance companies received public bailout through the TARP scheme, many others applied and others benefitted from capital relief thanks to *ad hoc* regulatory changes. Many of them came under distress as the large losses in their investment portfolio, coupled with long term guarantees to policyholders, and quickly eroded their capital base. Others, writing financial guarantees to other firms, were unable to pay the claims related to the defaults of mortgage backed securities. Finally, several life insurers qualified for public bailout because of their status of bank holding company[1].

In Europe, public support was given to the insurance subsidiaries of banks (such as RBS in the UK and Fortis in Belgium) and in particular, to three large Dutch financial conglomerates: ING, Aegon and SNS Reaal. Within the framework of a Europe wide financial plan, € 30 billion were made available to prevent a liquidity shortfall; 14 billion were actually used.

Regulators have started responding to the problems that surfaced in 2007/8 within a wider framework for the regulation of insurance activity at the global level. The measures aim to target two issues: how to regulate large and complex groups operating under different jurisdictions and how to mitigate the contribution the insurance sector may give to financial systemic risk. The focus of this paper is the latter set of measures.

In order to respond to the growing complexity of the global insurance business[2] the body in charge of coordinating insurance regulation internationally, the International Association of Insurance Supervisors, IAIS, has drafted a framework of globally accepted principles framing the supervisory activity, called ICP (Insurance Core Principles). This is a set of principles and standards intended to help local supervisors design and implement a more effective supervisory. These principles, which are not mandatory, are to be applied to any insurance company, on both a legal entity and group-wide level, and try to cover all aspects of the regulatory activity, from the powers of the supervisor, to the set-up of the risk management framework to the prevention of frauds and money laundering[3] .

[1] Schwarcz & Schwarcz (2014)
[2] See Schoenmaker, Osterloo, & Winkels (2008) for a description on how the globalisation of the insurance industry is changing the structure of large multinational groups, leading to the centralisation of some activities. Cummins & Venard (2007), provide some fitting examples of the tension between the existence of a global structure and the need to comply to strict national regulation and market practice.
[3] See IAIS (2011b) for a detailed list of the areas of application

The Insurance Core Principles have then been extended to create the Common Framework for the Supervision of International Insurers (ComFrame), a set of requirements specifically focused on the group-wide supervision of internationally active insurance groups (IAIGs): an IAIG is a n entity which writes premiums in at least three jurisdictions and at least 10% of them outside the home market and has total asset of at least USD 50 billion or gross written premiums of at least USD 10 billion, based on a three-year average. No distinction is made either between primary insurers and reinsurers or among pure life or P&C insurers and composite entities. The IAIS has so far refrained from publishing a list of the IAIGs, the number of which should be around 50 worldwide, according to press estimates. A crucial feature of the ComFrame is the provision of an additional capital charge to be applied to large international insurance groups; the details on how this capital charge will operate are to be disclosed in 2016.

The Development Phase of ComFrame began in 2010 and concluded at the end of 2013, with several ComFrame drafts released for public consultation during this period. Afterwards, a series of field test are being carried out, in order to assess how effective and feasible are the requirement, in order to amend it before its adoption, scheduled for the end of 2018. After adoption, IAIS members will start implementing it on a voluntary basis.

On top of the ComFrame, new regulation is being drafted in order to minimise the contribution of the insurance industry to systemic risk.
The starting point is of course to assess which parts of the insurance business may be a source of systemic risk. A discussion of what in the insurance business constitutes a source of systemic risk is clearly beyond the scope of this paper, and in-depth analysis of the issue can be found in several recent overviews[4].

In May 2011 the IAIS presented its thinking on the matter, and sketched the possible regulatory responses (IAIS, 2011a)

First of all the IAIS states that traditional insurance activity is not a source of systemic risk, as it entails underwriting risks that are (i) idiosyncratic (ii) not correlated with each other (iii) not influenced by the business cycle.
However, as shown by the collapse of AIG, insurance can contribute by systemic risk via non-traditional activities, which have rapidly increased in size and scope.
In life insurance, the existence of financial guarantees on capital and, above all, minimum guaranteed returns attached to many products complicate the risk profile with respect to standard, pure risk, products. The collapse in asset prices or yields may leave some insurers unable to pay the guaranteed returns, leading potentially to insolvency; the exposure of life insurers to the same asset classes can lead rapidly to contagion. Other problems could come from non-insurance activities such as trade in derivatives, used to hedge assets returns. In non-life insurance, systemic risk is restricted to very specific lines of business, such as the supply of credit protection in the form of credit insurance, credit guarantees and derivatives (especially CDS).

The IAIS argues that, given the overall small size of non-traditional insurance, the potential contribution to systemic risk by the industry should be limited. However, other considerations, related to the size of the entities and their geographical reach must be taken into account. Insurers are large institutional investors, holding large positions in fixed income securities; therefore a main source of risk is linked to large drops in bond prices, not to mention defaults.

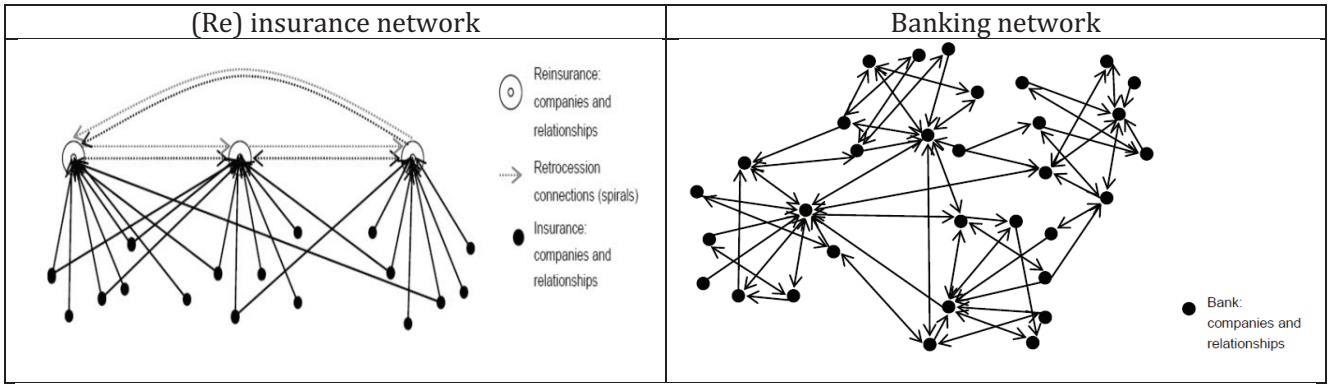
While systemic risk can arise due to the linkages between insurers and banks, the connections within the industry are much less a case for concern. As shown in Figure 1, there are profound differences in the way insurance companies and banks are interconnected. The banking networks allow for the possibility of

[4] See, among many others, Eling and Pankoke (2014), Cummings and Weiss (2013) and Geneva Association (2010).

distress in an entity to spread quickly to the rest of the industry, as shown by the freeze in the European interbank market in 2009 and 2011.
In insurance, on the contrary, the structure is normally highly hierarchical. There is almost no linkage among primary insurers; therefore there is not a network comparable to the interbank market. Risks in the insurance sector are redistributed by reinsurance companies. They receive risks from insurers and may share part of it with other reinsurers via retrocessions.

The insurer-reinsurer relationship can have non-negligible implications for systemic risk, according to IAIS[5]. The reinsurance market appears to be highly concentrated, and this leads to a strong interconnection between reinsurers and primary insurers ceding business to them. In principle the failure of a reinsurer may create problems as several contracts may be cancelled, leaving insurers without protection for tail risks, since contracts are very specific and difficult to be rewritten quickly.

Figure 1: insurance and banking networks compared



Source: Radice(2010)

Based on the considerations sketched above, IAIS has set up a framework to designate which insurance groups are systemically important (IAIS, 2012a), and devised for them specific policy measures (IAIS, 2012b). The designation was based on a set of indicators related to:

- Size: the importance of an entity increases with the amount of services provided; however a large size is also a prerequisite for effective risk pooling and diversification
- Global activity: the extent of international activity is a proxy of the negative externalities distress may generate
- Interconnectedness: interlinkages with other institution may give rise to systemic risk
- Non-traditional and non-insurance (NTNI) activities: activities such as investing massively in the bond market or entering into derivative contracts are thought to be the biggest potential sources of systemic risk
- Substitutability: the difficulty of replacing the services provided by an institution in distress increases its systemic importance

This indicators-based methodology was complemented by soft information on specific features of the companies and their products, gathered through interviews with national supervisors.

[5] For a completely opposite view see Kessler (2013)

On July 18th 2013 nine insurance groups were designed as systemically important (Global Systemically Important Insurers, G-SIIs). They are five European companies, Allianz (Germany), AXA (France), Assicurazioni Generali (Italy), Aviva and Prudential (UK), three from the US, AIG, MetLife and Prudential Financial, and a Chinese one, Ping An. In November 2014 the designation for these groups was confirmed, with no additions to the list.

Together with the first list, a set of policy measures for G-SIIs was decided. It includes the following[6]:

- Systemically important insurers will be subjected to a more intensive and coordinated supervision, on top of the other requirements determined by national (and supranational, in case of EU insurers) authorities. Moreover, plans to restrict non-traditional and non-insurance businesses and separate them from the mainstream activities may be envisaged.
- Increased resolvability of groups or parts of them, in order to improve the supervisor's ability to resolve an entity in distress, minimising the impact on the rest of the financial system and the taxpayer's exposure to the risk of loss. G-SII are required to present a plan detailing how to handle the restructuring in case of failure
- Higher Loss Absorbency (HLA): a higher level of capitalisation will be required given the risk G-SIIs pose to the global financial system. The initial step is constituted by a Basic Capital Requirement (BCR). The BCR is to be calculated using a factor based approach using risk weights related to different areas of activities, and applied on a group wide basis[7]. This will be replaced at some point by a Global Insurance Capital standard (ICS), which will be applied to all IAIGs.

The resolution plans were submitted to the regulator during the summer 2014 and, after a discussion begun in October 2013, in November 2014 the model to calculate the BCR was presented. The discussion on the HLA is expected to be completed in late 2015. From 2019, G-SIIs will be required to hold a level of capital no lower than the BCR. Figure 2 summarises the different layers of regulation and the type of companies affected by each of them.

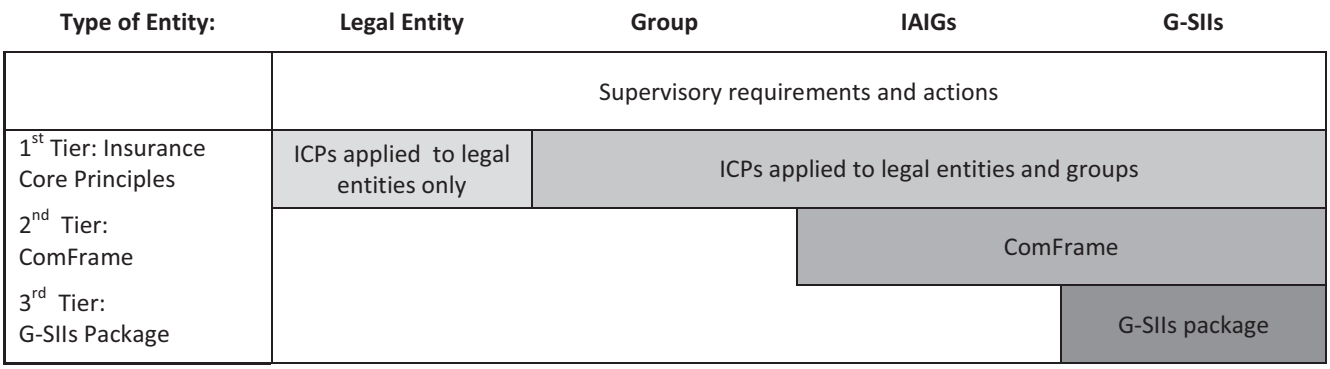
The new regulatory framework creates three groups of insurers:

1) Those that are too small or focused on just one market to be subjected to the ComFrame
2) The IAIGs which will have to adopt the ComFrame
3) A subset of the IAIGs, determined on an annual basis deemed to be systemically important, to which the G-SII regulation will apply

It follows that insurers belonging to group 1) will never be subjected to the G-SII regulation, whereas those in group 2) may be. In the empirical exercise I will exploit this fact to assess the impact of the evolution of the regulation on insurers' equity prices.

[6] For a quick presentation of the measures see IAIS (2014b)
[7] The details on how it is to be computed can be found in IAIS (2014a)

Figure 2: The regulatory framework



Source: Adapted from IAIS (2013)

The process of identifying the systemically important insurers has so far spanned over five years. These are the most salient events, which will be considered in the empirical analysis.

1) November 15th, 2011: The IAIS publishes a document on the relationship between insurance activity and systemic risk (IAIS, 2011) and sets a list of which actives undertaken by insurance groups can be a source of systemic risk. It contains also the first, tentative, list of policy measures to be taken in order to mitigate the contribution of the insurance industry to systemic risk.
2) January 10th 2012: The Financial Stability Board (FSB), the international body in charge of regulating the whole financial system, announces that the supervisory framework for systemically important financial institution will be extended to global systemically important insurance companies and other types of financial institutions[8]. No details are provided on how, when this would be done and how to define GSII
3) May 31st, 2012: IAIS releases its proposed assessment methodology for the identification of G-SIIs.

   According to the Financial Times (Masters & Gray, 2012)

   "Some 48 insurance groups in 13 countries are being targeted by global regulators for possible designation as "systemically important", a label that could lead to higher capital requirements and limits on business lines."

4) July 18th 2013: The list of G-SIIs is published, together with the revised list of policy measures.
5) December 16th 2013: The IAIS publishes, for public consultation the proposed methodology for the calculation of the Basic Capital Requirement for G-SII

3. The Role of Capital and The BE "too-big-to fail" Premium

Investor assessment on the measure is likely to be driven to a large extent by the result of the trade-off between the expectation of a "Too-big-to-fail" premium enjoyed by systemically important insurers and its cost, in terms of higher administrative charges and above all, higher and costlier capital requirements.

[8] See http://www.financialstabilityboard.org/2012/01/meeting-of-the-financial-stability-board-in-basel-on-10-january/

The G-SIIs regulation is based on a blueprint taken from banking prudential regulation, in which capital buffers clearly play a key role. However, this can be different, given the specificities of the two industries.

While banks and (life) insurers share the role of channelling savers' funds into investment and of large investors in financial markets, large differences emerge in several respects (Thimann, 2014). For the purpose of this analysis the most important ones are about the role of debt and capital, and therefore leverage.

Insurers, being pre-funded, do not need to issue much debt and, crucially, do not do that to finance core activities[9]. Financial assets are acquired using the insurance premiums already earned, and not issuing additional liabilities. Therefore, while a higher capital charge will slow down asset accumulation and leverage in bank, the same will not happen in insurance, as the size of the asset size is mostly determined by the amount of premiums written.

As explained in Planting & Rochet (2007), Chapter 4, in the traditional insurance business, capital serves as a buffer. If the proceeds from the sale of assets (which can take a long period and be conducted orderly) is not enough to cover all the claims, capital is used to pay the remaining claims, and only if it is depleted the claimholders suffer losses. It works somehow in the same way as the deductible in a non-life insurance contract.

Therefore, for insurers "raising capital […] means that there are (even) more assets available to cover the liability stream […], but such additional capital will be consumed, if at all, at the end of the process and has no crisis prevention or stabilisation function" (Thimann, 2014, page 16).

Additionally, bail in is built in in most of the traditional life contracts as a participation to the gains (or losses) of the financial portfolios where their premiums are invested. This works as an additional buffer on top of capital. Unit link contracts with no guarantees on the amount invested entail would be, by definition, bailed in by the policyholders[10].

In non-life insurance the policyholder's claim to be compensated is guaranteed by the law regardless of the financial performance obtained investing the provision. Policyholders are protected by the imposition of very prudent provisioning criteria, strong constrains on the asset classes in which provisions can be invested and/or by the requirement to hold extra capital over and above the technical provisions. Therefore, in these lines of business, a bail in is ruled out.

Therefore, as far as the bulk of the business is concerned, the specificity of insurance may call into question the usefulness of capital surcharges as systemic risk mitigating tool; as a consequence, it may be

[9] Normally debt is issued for M&A operations or to acquire fixed assets.

[10] However, the existence of guarantees on the premiums invested and of minimum return of course changes the conclusion. In this case an adequate level of capital woks as a buffer against adverse changes in the price and yields of financial assets. Recently, Berdin & Grundl (2015) develop a stylised model of a German life insurance companies and show that, in a scenario of prolonged low interest rate, quite a large number of companies with an insufficient level of capitalisation would run the risk of going bust as the yield on investment remains below the guaranteed returns for a prolonged period

argued that any new regulation which increases them may be perceived simply as an additional cost and investors may react negatively to news of their introduction.

Another crucial issue is whether insurers can be considered "too-big-too-fail", thus raising the expectations of a public bailout in case of distress.

As pointed out by Schwarcz & Schwarcz (2014), most of the U.S. insurers that received government support as a consequence of the 2007/8 crisis were not "too-big-to-fail" in terms of size, but experienced distress due to the strong exposure to the mortgage backed securities (both as liabilities for the companies writing credit insurance and as assets for life insurers) and the strong interconnections with other parts of the financial markets. The same applies for Europe, where it was mostly the banking and asset allocation arms of financial conglomerates which led to the distress which triggered the bailout.

Thus, it may be argued that the bailout was caused mostly by the activity undertaken by some insurers rather than by their size or core business.

However, given the evidence on AIG and the large Dutch conglomerates presented in Section 2, one could argue that, in case of other crises, large insurers could benefit from public bailout given:

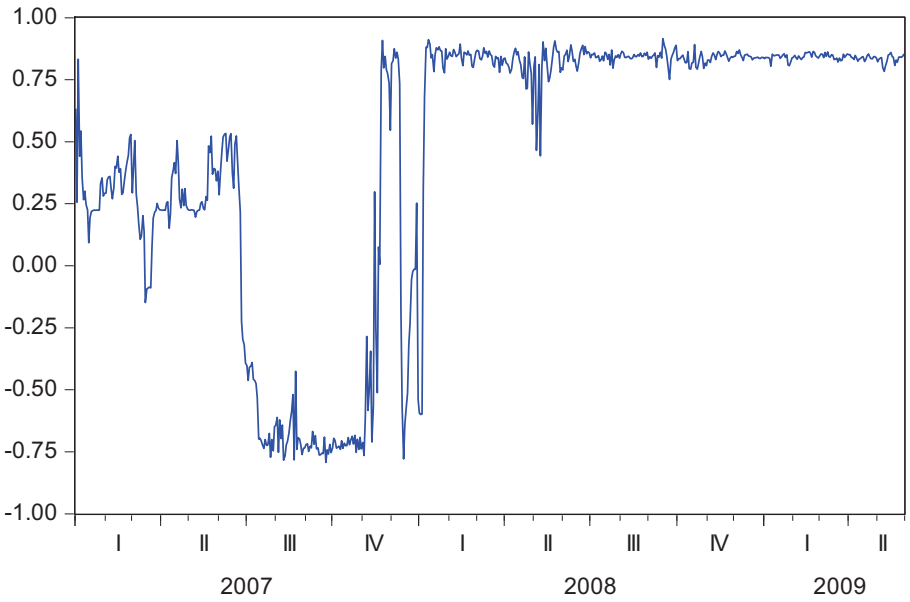
- The role they play in providing long term savings to large number of people and the fact that the failure of a life insurer could lead to loss of confidence in the industry as a whole
- The weight of their investment in some asset classes (for example government and sovereign bonds); distress could trigger a fire sale of assets leading to potentially destabilising effects on prices. However the extent of the sales may be limited by the ALM strategy requiring the reduction of maturity mismatch.
- The possibility of large losses in policyholder wealth due to the financial distress of an insurers and or the plunge in equity prices propagates to other parts of the financial markets, undermining the confidence in the whole system. Figure 3 plots the dynamic correlation between the prices of CDS of ING and Aegon's debt. The unfolding of the subprime crisis in the final months of 2007 led to a spike in the correlation between the perceived default risks.

According to the regulator, two main arguments supported the intervention (IAIS, 2011):

- Large losses in the investment portfolios of the insurance business led to a drop in solvency ratio; the ongoing chaos in the financial market exposed the banking arms to severe liquidly problems, preventing the access to market to restore the capital buffers of the insurance business.
- In a conglomerate, the loss of confidence in the banking or insurance sector may have propagated to the other activity, and then to the rest of the financial system.

All this suggest that the existence and size of the TBTF premium is something that has ultimately to be assessed empirically.

Figure 3: Dynamic Conditional Correlation* between CDS prices: ING and Aegon



*Computed using the Dynamic Conditional Correlation approach presented in Engle (2002).

The impact on the new regulation on systemically important financial institutions (SIFIs) on the banking sector is the subject of a few recent papers[11]. Less has been written so far concerning insurance.

The consequences of the AIG crisis and following bailout on stock prices are studied by Safa, Hassan, & Maroney (2013). They analyse the impact of the most important events related to the insurer's near bankrupt, assessing the extent of the contagion to other parts of the US financial industry. They find that the news of the first bailout had a positive effect on insurers' equity prices; in the day following the announcement average prices were 4% higher than what projected by a factor model. However, immediately after the second bailout, stocks were 7% down with respect to the same benchmark. Equity prices of banks, brokers and Savings and Loans institutions show the same pattern. According to the authors, this indicates that, initially, the bailout was welcomed by market, but the successive realisation

[11] For example, Bongini, Nieri, & Pelagatti (forthocoming) studies whether the release of information concernng the methodology to identify SIFI, the list of designated banks and the new capital requirements had different impacts on the affected banks from that on non designated bank. All in all, they find that the market reaction to the announcement was not very strong, slighly negative but very diverse according to the banks'characteristics (level of capitalisation, retail versus investment banks, etc.). Mixed but very weakly negative results are found by Kleinov et al. (fortcoming): interestingly, they find that the announcement of the banks designed as systemic leave their stock prices unchanged, and interpret this find as a sign that investors were able to predict the outcome of the designation process. Moenninghoff et al. (forthcoming) find that, overall, the new regulation has a negative impact on the banks affected, which is however mitigated by the positive effect of the official designation. They also find that such a positive reaction may be linked to the expectation of a "Too-Big-to-Fail" guarantee, which is exacly what the new regulation is meant to avoid. (Schäfer, Schnabel, & Weder di Mauro, 2015) use event studies to analyse he impact of other reforms enacted after the subprime crisis in the US and Europe finding that overall, they reduce bailout expectationa at the ezpenses of lower equity returns.

that the crisis persisted and a new capital injection was needed depressed the valuations. Moreover, the authors try to test whether the Federal Reserve perceived AIG as too big to fail. They estimate a factor model for financial intermediaries' stock prices and introduce dummies for the period after the disclosure of large losses by AIG and before the first bailout ("crisis period") and for that including the two bailouts ("post-crisis period"). If AIG was perceived as to big to fail, stock returns would have discounted an intervention by the Fed and the dummy for the crisis period would have been positive. Conversely, the dummy for the post crisis period would be negative. The estimated coefficients, albeit having the expected sign, are not significant and this leads the authors to conclude against the Too Big to Fail hypothesis.

Dewenter & Riddick (2015) study the impact of several events on equity prices of the eight of the nine insurers that have been named as systemic and a "control" sample of other 22 entities with similar characteristics. They consider the first AIG bailout and a few steps of the evolution of the G-SII regulation. They find that, summing the reactions to these events, designated firms enjoyed, on average, a "Too-Big-To-Fail" premium of roughly 10% with respect to the other entities considered. Moreover, the find that in the G-SII sample, positive abnormal returns in several events are positively correlated with companies' leverage and standard measures of systemic risk constructed using equity prices; this reinforces the authors' view of the existence of a TBTF guarantee. Their analysis reaches three main conclusions:

"[…] first, […] equity investors conclude that the potential benefits of the TBTF guaranty outweigh potential compliance costs for the designated firms, with stock prices rising an average 11.7% across the eight announcements, corresponding to an economically significant net increase in G-SII market value of $17.2 billion. The equity gains are not associated with a perceived fall in default probability, but are associated with an increase in implied asset risk of approximately 15%, and with a 2.5% abnormal loss to bondholders. These results are consistent with investor expectations that protected firms will increase asset risk in response to the moral hazard created by protection against default, and with investor expectations that bondholders will bear more risk and higher losses if the firm does fail, even with the G-SII protection. Second, we find that other large non-designated insurance firms do not, on average, enjoy any net benefits or costs from the new regulatory regime[…] consistent with the market recognizing that these firms fall outside of the TBTF umbrella. Third, we find that investors identified the likely candidates for G-SII designation very early in the process, with most of the net benefit embedded in stock prices a year before the final announcement of specific names" (Dewenter and Riddick, 2015 pp. 32 and 33)

Using a slightly different methodology in terms of estimation and choice of events and considering a much larger sample of securities, I reach somewhat different conclusions.

In the remainder of the paper I will seek to provide an empirical test of the following hypotheses:

1) The G-SII regulation is not considered important and therefore the new pieces of information have a neutral impact on stock returns
2) The new regulation does have an impact, the sign of which derives from the balance of two effects
    a. The new regulation, and especially the stricter capital requirements, may make insurers safer, reducing their cost of equity and propping up returns. At the same time, being designated as systemic implies the expectation of some sort of public

guarantee: in this sense "systemic" can be read as "too big to fail" and implies an indirect subsidy which boosts returns upon designation announcements.

b. The higher costs and burden entailed by the new regulation offset the perceived TBTF benefits, leading to negative response of stock prices to any announcement

5. METHODOLOGY

The methodology used for the event study follows closely the standard one described in Campbell, Lo, & MacKinlay (1997) and McKinlay (1997) and surveyed more recently in Kothari & Warner (2007). For each company and announcement I estimate a simple market model using 88 observations ending three days before the event date; the sample length corresponds to four months of transactions and seeks to strike a balance between the need to have enough information to get sound parameter estimates of the and minimise the probability of the estimates being contaminated by other events, an issue that is particularly relevant given the large volatility stock markets experienced in 2009-2012.

As a regressor I use the national market index for the county where the company is listed, following the results of Campbell, Cowan, & Salotti (2010). While such a choice might be questionable in an analysis of the banking sector, given the weight credit institutions have on the stock markets in some countries, the issue is much less relevant for insurers the capitalisation of which is much smaller. My preferred measure of abnormal returns is computed over the event day (or first trading day after that if the event happens during the week end or in a bank holiday) and the next, in order to account for differences in the time zones and lagged perception of the implications of the regulatory actions.

I use the daily returns of all the insurers stocks included in the Datastream World Insurance index that were continuously traded between June 2011 and November 2014. I exclude brokers and analyse the impact on the six largest reinsurance companies in the world just as a robustness check, as their prudential supervision related to systemic risk is not tackled by the measures under analysis[12]. I end up with 121 securities. The list can be found in Appendix A.

Then I consider different subsamples if insurers and test whether, on average, the event produced statistically significant abnormal returns and then if they were different across subgroups, using some parametric and non-parametric tests.

Since I consider to the same set of events for all the security and the assumption of absence of cross section correlation needed to aggregate abnormal returns is not met. Therefore, in order to test whether the Cumulative Average Abnormal Returns (CAAR) of each subgroup is different from zero I employ the parametric test introduced by Bohemer, Musumeci & Poulsen (1991) and modified by Kolari & Pynnonen (2010), which adjusts the variance of the standardised CAR taking into account both serial correlation and cross section correlation across securities' abnormal returns; this latter issue can also be potentially a

[12] The decision on the list of global systemically important reinsurers and the policy measures was scheduled for July 2014 but has been delayed.

serious problem in case of concurrent event affecting a subset of insurers, such as, for example, a development of the Eurozone debt crisis.

I cross-check the results with those of a non-parametric test, the Generalised Sign Test explained in Cowan (1992). The whole procedure is explained in Appendix B.

To test whether the difference between two groups is significantly different from zero I employ a simple t-test and a (non-parametric) Wilcoxon rank-sum tests. In order to test the difference between three groups I employ the non-parametric Kruskall-Wallis test on the difference between medians.

Additionally, I check for the existence of other events that may have influenced insurers' stock prices in the dates analysed, using event study papers related to the period under analysis[13] and the Financial Times website. I do not found any significant event that can confound the results.

As a robustness check, I consider the results obtained from two alternative models. Firstly I consider a larger window, covering two days before and after the event, to account for possible leaks and a slower reaction to the news. Then I re-estimate the market models using for each security a global stock market index (the Morgan Stanley Global Index), as done in other recent multi country event studies[14].

In order to test the significance of the average stock price response to the regulatory announcements, I split the sample in two ways. First of all, I consider the insurers that meet the IAIG definition and the others. Data on total assets are taken from Worldscope, and I look into company statements to figure out the geographical scope of the activity. I was able to identify 38 entities meeting the IAIG criteria: adding to them the six global insurers the final number is not too far away from the "around 50 insurers" affected by the regulation declared by IAIS. Then, within the IAIG sample, I consider the nine insurers designed as G-SII in 2013 and those not designed. As an alternative, I group the IAIGs according to the region where they hare headquartered, creating to groups: EU-based, US-based and those located in the rest of the world.

Subsequently, I consider just the sample of IAIGs, and focus on the performance of the individual securities trying to assess which characteristics explain the size of the abnormal returns in selected events. Given the very small number (38) of data points I focus on size, a proxy for the weight of non-insurance activity and a measure of leverage. As emphasized by Bongini, Nieri, & Pelagatti (forthcoming) concerning banks, it is likely that less capitalised entities would benefit more from being perceived as "too-big-to-fail" and suffer more from the obligation to raise capital levels.

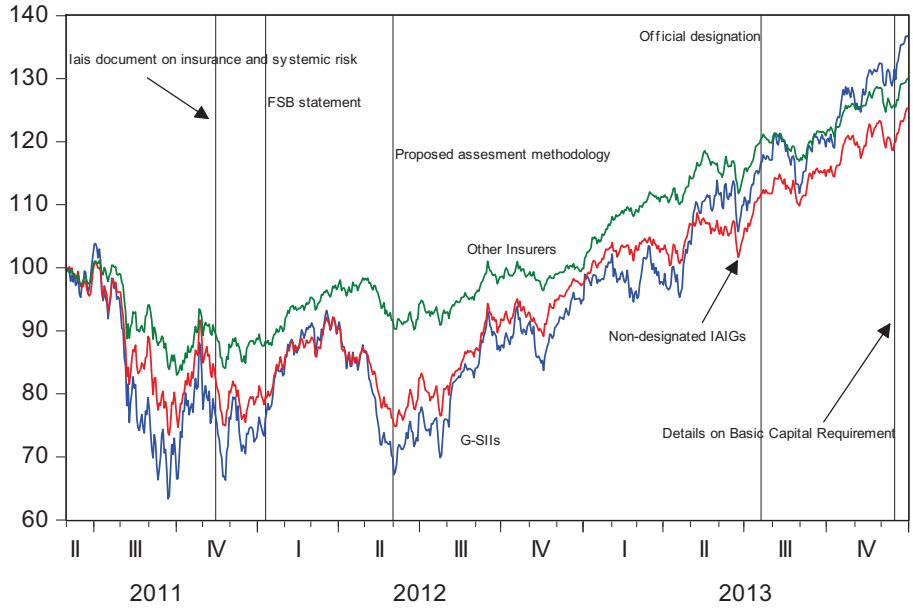
6. RESULTS

Figure 4 shows the behaviour of three equally weighted indexes for the G-SIIs the IAIGs which have not been designated and the other insurance companies and highlights the dates of the five events considered. Large fluctuations in correspondence with some events can be detected, but it is difficult to pin down a clear long term pattern suggesting that the new regulation may have had a long-term impact on equity prices.

[13] Altavilla, Giannone, & Lenza (2014), Stracca (2013), Gagnon, Raskin, Remache, & Sack (2011)
[14] For example Schäfer, Schnabel, & Weder di Mauro (2015). Securities prices are converted into US dollars in order to avod spurious volatility due to exchange rate fluctuations.

Table 1 details the results of the test on the cumulate returns, comparing the IAIGs that were designated as systemically important, the other IAIGs, and the other companies. The Cumulative Average Abnormal Return is reported in the fourth column, followed by the p-values of respectively the Kolari and Pynnonen (KP) test and the Generalised Sign Test (GST).

Figure 4: G-SIIs, non- designated IAIGs and other insurers, USD equity prices (June 1st 2011=100)



The seventh column has the differences between the CAAR for the G-SIIs group and the others, and then the p-value of the t-test on the difference and that of the Wilcoxon rank sum test. Finally the p-value of Kruskall-Wallis (KW) test on the differences in the medians of the three groups is reported.

The disclosure of the activities the IAIS thinks are source of systemic risks (Event 1), in November 2011 follows the publication of the criteria used to define an IAIG, occurred in July of the same year, and therefore investors were in principle already able to identify the type of companies liable to be targeted by the new regulation. Large, international insurers show negative and statistically significant abnormal returns on average, while companies too small and local do not record any significant abnormal return. At this stage investors do not seem to be able to pick which companies would have been identified: the average CAAR of the G-SII group is lower than that of the group of the non-designed ones, but the difference is not significantly different from zero.

A clear distinction between the subgroups also appears in the reaction to the following event, the FSB announcement of the extension to insurers of the regulation for systemically important institutions. Here, an explicit connection is made for the first time to the regulation coming into force for banks and that for insurance that begins to be planned. Investors appear now to be able to distinguish among IAIGs, and the group of G-SII enjoys a large and significant positive return (2.94%), which translates into a 1.08% extra-return over the other IAIGs and a 2.62%over non IAIGs.

The FSB statement lacks any detail on how the specific regulation for insurance was to be framed, and therefore the results can be rationalised as the expectation of some form of guarantee linked to the

systemically important status or the possibility to be designated as such. In line with some evidence for the banking sector and the findings of Dewenter & Riddick (2015), this can be interpreted as the value of the implicit "Too-big-to-fail-guarantee", conditional on the information available on the event date.

Table 1: Cumulative average abnormal returns, G-SII, other IAIGs and other insurers

Event	Date	Description		CAAR	KP§	GST§	Diff. Vs. SII	p-val.	Wilcoxon§	KW§
1	November 15th 2011	The IAIS publishes a document on the relationship between insurance activity and systemic risk. and sets a list of which actives undertaken by insurance groups can be a source of SR	SII	-1.31	0.02**	0.06**				
			Non-SII	-1.08	0.08*	0.00***	-0.23	0.35	0.46	0.00***
			Other	0.36	0.14	0.43	-1.67	0.01***	0.02***	
2	January 10th 2012	The FSB announces that the supervisory framework for systemically important financial institution will be extended to global systemically important insurance companies and other types of financial institutions.	SII	2.94	0.13	0.00***				
			Non-SII	1.86	0.28	0.00***	1.08	0.11	0.08*	0.00***
			Other	0.32	0.22	0.01***	2.62	0.00***	0.00***	
3	May 31st, 2012	IAIS releases its proposed assessment methodology for the identification of G-SIIs	SII	-0.23	0.03**	0.04**				
			Non-SII	-0.24	0.36	0.45	0.01	0.50	0.42	0.41
			Other	0.05	0.01***	0.01***	-0.28	0.34	0.11	
4	July 18th 2013	The list of G-SIIs is published, together with the list of policy measures	SII	-0.20	0.26	0.30				
			Non-SII	0.19	0.24	0.11	-0.39	0.18	0.33	0.43
			Other	-0.15	0.45	0.39	-0.05	0.41	0.47	
5	December 16th 2013	IAIS releases the public consultation document on the calculation of the basic capital requirements to be imposed to G-SIIs	SII	-0.82	0.00***	0.01***				
			Non-SII	0.44	0.20	0.31	-1.26	0.00***	0.04**	0.01***
			Other	-0.61	0.00***	0.00***	-0.21	0.21	0.22	

§p-values. Significant at ***1% **5% *10%

The presentation of the methodology to be employed to identify a G-SII (Event 3) does not appear to be related to any significant difference in the average returns. This can be interpreted as investor having already guessed which companies would have been designed and adjusted their valuation accordingly.

This view seems to be confirmed by the fact that the formal designation itself (Event 4) is not met by statistically significant abnormal returns.

On the contrary, when details emerge on the most important policy measure, the Basic Capital Requirement for G-SIIs (Event 5), a clear distinction shows up. The insurers which are subjected from the beginning to the new capital requirements experience a statistically significant -0.8% CAAR, the other IAIGs show no significant abnormal returns, whereas for the other insurers the CAAR was a significant -0.6%. The difference between designed and non-designed IAIGs amounted to a statistically significant -1.26%. These results, being related to an estimate of the capital burden designated insurers will incur, can be interpreted as the perceived cost of the "too-big-to-fail guarantee".

The negative performance of the insurers which do not meet the IAIG criteria may be rationalised as the realisation by investor that these entities would not be covered by the regulation mitigating systemic risk. In other words, the results of Event 5 show that being outside the "club" of IAIGs has some costs, but being inside it and having to face systemic risk related charges is not a free lunch and entails a significant stock market penalisation.

Table 2 presents the results of the analysis for the IAIGs group only and when the grouping according to the localisation of the headquarter is considered: European Union (EU), United States (US) and rest of the world (ROW). This splitting is meant to capture the impact of the differences in the regulatory regimes with which the new framework will coexist.

First of all, it must be noted that the response of the ROW group is never significantly different from zero as long as the parametric tests are considered; the large heterogeneity in the regulatory frameworks is probably responsible for the large variability of the abnormal returns.

The methodology proposed by the IAIG to identify systemically important insurers (Event 3) is viewed by investor as more damaging for European concerns than for US ones, whereas the difference with those in the rest of the world is not significantly different from zero. When the single most important measure is tackled, with the discussion of the details of the calculation of the BCR (Event 5), it is the US group which records a negative differential with respect to the EU based insurers.

In order to assess the robustness the results, especially as fat as the ability of investors to pick which companies would have been affected by the new measures, it may be useful to compare the behaviour of primary insurers versus that of reinsurers. To this end I add to the sample the six reinsurers which fit the IAIGs criteria[15]. Table 3 presents the result of the split between IAIGs, Other insurers and large reinsurers.

Concerning the first event, the absence of any statistically significant CAAR for the insurance group and the difference with respect to IAIGs' abnormal returns confirm the view that the information provided by the IAIS paper was enough to enable investor to discriminate the companies liable to be affected by the new regulation. The same applies for Event 2; moreover, the slightly negative CAAR for reinsures is an indication that investors ruled out any form of TBTF premium benefitting reinsurers. The strong CARR posted in events 3 and may be interpreted as the indication of investors reacting positively to the

[15] They are QBE (Australia), Swiss RE (Switzerland), SCOR (France), Munich Re and Hannover RE (Germany). Berkshire Hataway was excluded as, while listed as a reinsurer, is in fact a large conglomerate.

realisation that reinsures were (temporarily) "off the hook" as far as systemic risk regulation was concerned.

Table 2: Abnormal Returns, IAIGs split by geography

Event	Date	Description		CAAR	KP§	GST§	Diff. Vs. EU	p-val.	Wilcoxon§	KW§
1	November 15th 2011	The IAIS publishes a document on the relationship between insurance activity and systemic risk. and sets a list of which actives undertaken by insurance groups can be a source of SR	EU	-1.07	0.08	0.00***				0.73
			US	-1.33	0.03	0.02**	0.26	0.34	0.15	
			ROW	-1.08	0.48	0.07*	0.01	0.50	0.37	
2	January 10th 2012	The FSB announces that the supervisory framework for systemically important financial institution will be extended to global systemically important insurance companies and other types of financial institutions.	EU	2.20	0.09	0.44				0.76
			US	2.49	0.37	0.15	-0.29	0.49	0.20	
			ROW	1.37	0.44	0.00***	0.83	0.15	0.28	
3	May 31st, 2012	IAIS releases its proposed assessment methodology for the identification of G-SIIs	EU	-1.57	0.16	0.00***				0.12
			US	0.86	0.23	0.19	-2.42	0.03***	0.12	
			ROW	0.14	0.38	0.36	-1.70	0.09*	0.28	
4	July 18th 2013	The list of G-SIIs is published, together with the list of policy measures	EU	0.29	0.33	0.03**				0.79
			US	0.28	0.19	0.15	0.01	0.50	0.28	
			ROW	-0.29	0.39	0.34	0.58	0.19	0.26	
5	Dec. 16th 2013	IAIS releases the public consultation document on the calculation of the basic capital requirements to be imposed to G-SIIs	EU	0.30	0.35	0.03**				0.03**
			US	-0.62	0.11	0.01***	0.92	0.01***	0.01***	
			ROW	0.43	0.46	0.50	-0.13	0.50	0.34	

§p-values. Significant at ***1% **5% *10%

The results of the robustness tests are reported in Appendix C. The results obtained using a single global index in the market model are exactly in line with that of the baseline model far as the size and significance of the events are concerned. On the contrary, moving from a two-day to a much larger five-day window gives more volatile results, as expected.

Summing up, some of the regulatory announcement had a non-negligible impact on insurers' stock prices. The first official documents by the IAIS mentioning systemic risk depressed the valuation of IAIGs, but then, when the FSB suggested that insurance and banks could be somehow "lumped" together as far as systemic risk regulation was concerned, IAIGs experienced positive abnormal returns. On top of that investors appears to be able to distinguish the insurers most likely to be designed, well ahead of the formal designation; the information provided by the IAIS in its methodological paper seems to have been enough to enable them to pick those which would have been designed, despite the fact that investors have a much narrower information set than the regulators.

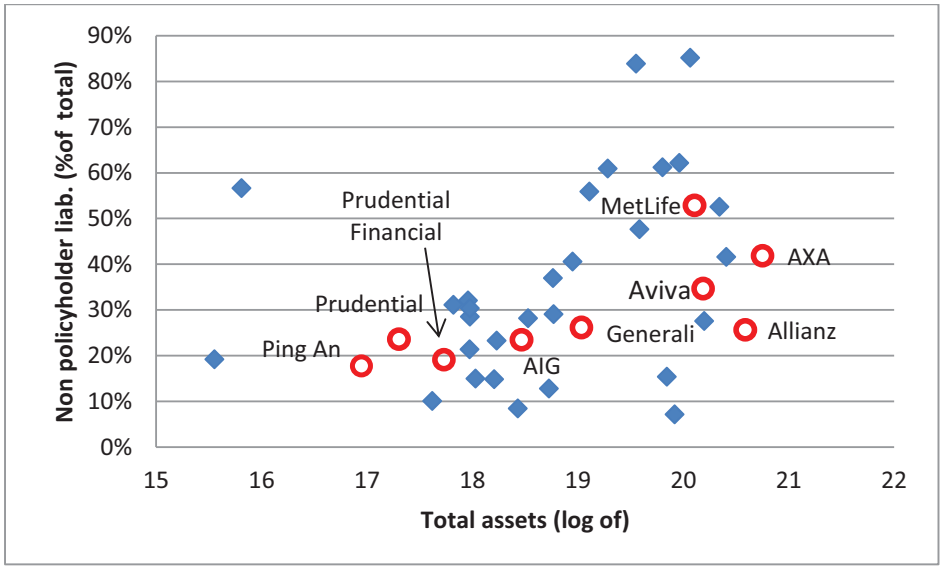
Table 3: Abnormal Returns, insurers and reinsurers

Event	Date	Description		CAAR	KP§	GST§	Diff. Vs. IAIGs	p-val.	Wilcoxon§	KW§
1	November 15th 2011	The IAIS publishes a document on the relationship between insurance activity and systemic risk. and sets a list of which actives undertaken by insurance groups can be a source of SR	IAIGs	-1.13	0.07*	0.00***				0.00***
			Other	0.36	0.14	0.43	-1.49	0.00***	0.00***	
			Reins	0.76	0.24	0.10*	-1.89	0.05**	0.12*	
2	January 10th 2012	The FSB announces that the supervisory framework for systemically important financial institution will be extended to global systemically important insurance companies and other types of financial institutions.	IAIGs	2.11	0.27	0.00***				0.07*
			Other	0.32	0.22	0.01***	1.79	0.00***	0.00***	
			Reins	-0.60	0.00***	0.08*	2.71	0.07*	0.04**	
3	May 31st, 2012	IAIS releases its proposed assessment methodology for the identification of G-SIIs	IAIGs	-0.23	0.22	0.20				0.22
			Other	0.05	0.01***	0.01***	-0.28	0.26	0.18	
			Reins	0.61	0.18	0.00***	-0.84	0.15	0.28	
4	July 18th 2013	The list of G-SIIs is published, together with the list of policy measures	IAIGs	0.10	0.37	0.14				0.24
			Other	-0.15	0.45	0.39	0.25	0.25	0.12	
			Reins	0.82	0.11	0.01***	-0.72	0.24	0.26	
5	Dec. 16th 2013	IAIS releases the public consultation document on the calculation of the basic capital requirements to be imposed to G-SIIs	IAIGs	0.15	0.47	0.19				0.15
			Other	-0.61	0.00***	0.00***	0.76	0.00***	0.01***	
			Reins	-0.06	0.25	0.36	0.21	0.12	0.36	

§p-values. Significant at ***1% **5% *10%

However, considering just three variables related to systemic risk[16] such as size, the share of non-insurance activities (proxied as 1 minus the share of insurance provisions in total liability) and gearing[17], the group of designated G-SII does not seem to stand clearly out from the other IAIGs, as shown figure 4 and 5[18]. Engle, Jondeau, & Rockinger (2015) measure the systemic risk of the largest European financial institutions, and find that the only one of the entities designated by the IAIS ranks among the five most systemically important insurers. They attribute this to the fact that the IAIS criteria give a stong weight to size, while their measure of systemic risk is based on leverage.

Figure 4: Size and weight of non-insurance activities (2010 data)



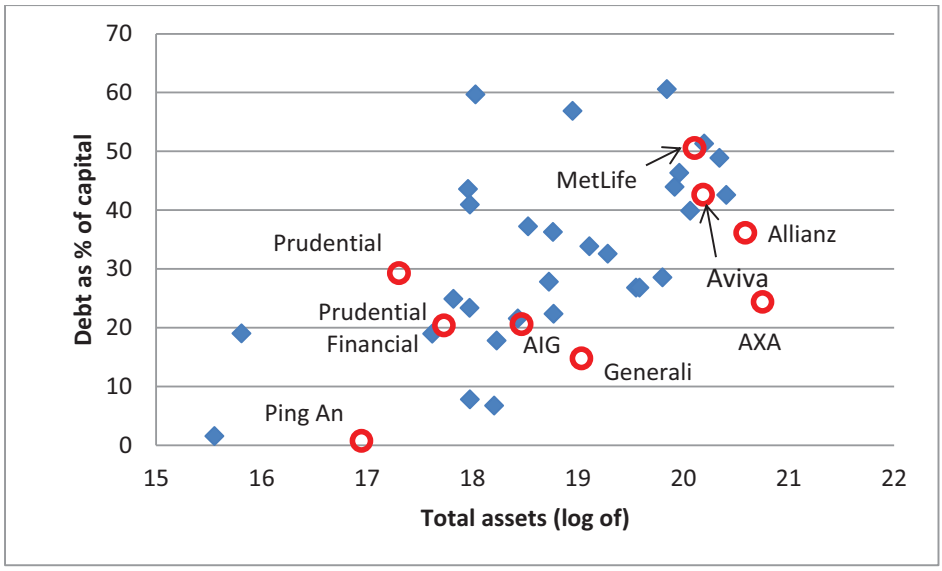
Source: Worldscope

[16] Unfortunately, crucial measures such as the extend of geographical distribution of the business and the exposure to certain financial instruments such as derivatives are not available on a consistent basis for all the companies considered

[17] I do not use a measure of leverage akin to that used by banks as policyholder reserves used to purchase assets are different from the short term debt banks use for the same purpose. In insurance, ALM is aimed at avoiding maturity mismatch and creates a link between policyholder reserves and assets which need not exist between deposits and loans: moreover, as debt is not used by insurers to buy financial assets, its main on the asset side are goodwill, cash or fixed assets. For these reasons a leverage ratio would better not be defined as the debt over capital, i.e. the gearing ratio (Thimann, 2014).

[18] Of course this is far from a proper cluster analysis and the results are by no means conclusive. Clustering techniques have been used by Masciantonio (2013) to identify European systemically important banks starting from public balance sheet data. Such a methodology could be fruitfully applied to insurance companies too. Weiss et al. (2015) compute some standard measures of systemic risk, based on equity and asset prices, for a large sample of insurers: they find that that they are positively associated to interconnectedness with the rest of the financial sector, measured using the methodology outlined in Billio, Getmansky, Lo, & Pelizzon (2012) and, most importantly, leverage, efficiency and overall stock market performance.

Figure 5: Size and gearing (2010 data)



Source: Worldscope

In order to understand the importance of these proxy for systemic risk in deriving investors' assessment of the supervisory framework I then consider the sample of the IAIGs, i.e. all the companies that at some point may be affected by the regulation and regress the CAAR for the most significant events (1, 2, and 5) on size, gearing and the importance of non-insurance activity. Moreover for event 5, I also a dummy for the entities headquartered in the US. This is the clearest way to gauge how investors assess the compatibility with the global framework being developed and the existing national regulation. This is relevant in light of the expected developments in prudential regulation: the Solvency II regime, coming into force for all EU-based companies in 2016 foresees a risk based capital weighting scheme, whereas US companies will stick to the risk weighting scheme.

Consider first the results for event 1 and 2 reported in Table 3 (first and second columns). They show that size is positively related to CAAR for both events and that, Event 2 extra returns have a positive correlation with company's gearing.

If the positive abnormal returns are interpreted as an expectation of a TBTF guarantee, this accrues, as expected, to larger entities and those that, being more leveraged, would be more in need of a public bailout. The relative size of non-policyholders' liability is not statistically significant. Consider then the third column, which shows the same model (plus the dummy for US insurers) applied to Event 5. It appears that size is no longer correlated with the response. Interestingly, in event 5 the relationship with gearing remains significant but switches sign: more leveraged firms may need extra efforts to raise capital to meet the BCR and this seems to be priced in in their stocks. On top of that, companies being based in the US have a stronger penalty, possibly suggesting a more difficult compatibility between the BCR and the local solvency regime.

Table 3: Determinants of Abnormal Returns in selected events

Dep. Var: CAR	Event 1	Event 2	Event 5
Constant	-10.42	-11.74	0.14
	[-2.46]*	[-2.46]*	[0.04]
Total asset (log)	0.57	0.59	0.10
	[2.11]*	[2.19]*	[0.51]
Debt/capital	-0.04	0.07	-0.03
	[-1.38]	[2.52]*	[-2.41]*
Non policyholder liabilities	-1.06	1.59	-1.51
	[-1.16]	[0.79]	[-1.44]
Headquartered in the US			-1.40
			[-2.98]**
Observations:	38	38	38
R-squared:	0.11	0.28	0.32
F-statistic:	1.47	4.37	3.93
Prob(F-stat):	0.24	0.01	0.01

Significant at ***1% **5% *10%

7. DISCUSSION

Some of the steps of the development to the regulation did cause significant abnormal returns in insurers' equity prices. The cumulative effect differs greatly between groups: considering the group of G-SII the events for which the CAAR are different from zero at at least the 10% level for both the Kolari-Pynnonen and the Generalised Sign Test (events 1, 2, 3 and 5) the cumulative impact is 0.58%. The cumulative difference over non-designed IAIGs, when it is significantly different from zero (events 2 and 5), amounts to -0.18%, whereas that over non IAIGs, considering events 1 and 2, is 0.95%.

The first conclusion that can be drawn is that the net effect of the perceived value of the TBTF guarantee related to be designated (or initially perceived by investors as) systemically important and its price is relatively small, less than 0.6%, and the difference with respect to IAIGs not having this status is slightly negative. This contrasts sharply with the nearly 12% (10.3% considering only the statistically significant responses) TBTF premium estimated by Dewenter & Riddick (2015), which put together the reaction to the first AIG bailout and some of the steps of the G-SII regulation process. Some of the differences may be due to the choice of the events: in particular their analysis stops at the designation of the G-SIIs, while mine includes the publication of the details of the Basic Capital Requirement.

It is, however, important to notice the quite large difference with respect to the group of smaller companies which do not met the IAIG criteria, suggesting that, possibly, some form of implicit guarantee could come from the ComFrame regulation. This warrants a further investigation, especially of what happens once the details on the International Capital Standard to be applied to IAIGs are disclosed.

However, the process of regulating the sources of systemic risk in insurance is at a realtively early stage, compared with that of the banking sector and therefore the overall impact may not, at present, be very informative. What matters more is probably the effect of the additional information provided by the events.

Considering the G-SIIs group, only the - rather vague - statement by the FSB on the extension of the framework for G-SIFI to insurance was met by positive abnormal returns. The following steps, where details on how to identify SII (event 3) and, crucially, how to calculate the BCR (event 5), were accompanied by negative abnormal results. This is likely to indicate a pessimistic revision of the investors' assessment of the impact of the new regulation on insurers' profitability.

The revision in expectations appears also in the results of the regressions of the CAAR for events 2 and 5 on companies' size and, crucially, gearing. When the FSB declared that the systemic risk framework would encompass also insurers, the benefit in terms of extra returns was larger for bigger and more leverage insurers, consistent with the TBTF premium hypothesis. However, once the details of the measures, and in particular the calculation of the BCR were known, size no longer matter and more geared insurers experienced larger negative abnormal returns, consistent with the view that the new measures represent a higher cost for firms as they will have to recapitalise. Bongini, Nieri, & Pelagatti (forthcoming) find a similar result for banks.

8. Conclusion

This paper tries to assess the impact of the evolution of the regulation addressing systemic risk of a large sample of insurance. The new regulation matters to investors, as some of the key steps were accompanied by statistically significant abnormal returns and investors seems to have understood which entities would have been designed well ahead of the publication of the list. The initial reaction was very volatile; the negative abnormal returns associated with the discovery of what, according to the regulator, constitutes a source of systemic risk led to negative results for large multinational turned positive for the group of firms that would have been designated later on. After the formal designation, which did not trigger any abnormal return, the release of the methodology for the calculation of the BCR led to negative abnormal returns for the insurers affected. Gearing is an important driver of the results. Its correlation with the cumulated results, which was positive upon the announcement of the extension of the SIFI status to insurers before turning negative when investors were able to estimate the cost of being systemically important in term of capital requirement. This is consistent with an evolution of market perception from an initial expectation of a TBTF premium to a more pessimistic assessment of the costs and burden related to the new regulation, especially for US-based entities.

It is important to stress that these are just preliminary findings, as several other pieces of the regulation are missing. Arguably, the next important steps would be the presentation of the final Higher Loss Absorbency proposal, at the end of 2015 and then, by the end of 2016 the launching of the International Capital Standard.

APPENDIX A: INSURERS CONSIDERED

INTERNATIONALLY ACTIVE INSURANCE GROUPS

	Name	Country	Assets 2010 YE (USD '000)
Designated as G-SII in 2014 and 2014	AVIVA	UNITED KINGDOM	591820229
	ALLIANZ	GERMANY	881697289
	AXA	FRANCE	1037518855
	ASSICURAZIONI GENERALI	ITALY	597900960
	PING AN INSURANCE	CHINA	169752469
	PRUDENTIAL	UNITED KINGDOM	419755352
	AMERICAN INERNATIONALGROUP	UNITED STATES	683443000
	METLIFE	UNITED STATES	730906000
	PRUDENTIAL FINANCIAL	UNITED STATES	539854000
Non Designated	AGEAS (EX-FORTIS)	BELGIUM	142342814
	MANULIFE FINANCIAL	CANADA	406783811
	POWER FINANCIAL	CANADA	138358244
	SUN LIFE FINANCIAL	CANADA	203583257
	MAPFRE	SPAIN	64569551
	CNP ASSURANCES	FRANCE	451545437
	AEGON	NETHERLANDS	472167398
	TOKIO MARINE HOLDINGS	JAPAN	188605816
	MS&AD INSURANCE GP.HDG.	JAPAN	82463115
	SONY FINANCIAL HOLDINGS	JAPAN	65482398
	SAMSUNG FIRE & MAR.IN.	KOREA (SOUTH)	23830851
	LEGAL & GENERAL	UNITED KINGDOM	524189226
	STOREBRAND	NORWAY	69243952
	VIENNA INSURANCE GROUP	AUSTRIA	55359872
	OLD MUTUAL	UNITED KINGDOM	313392987
	RSA INSURANCE GROUP	UNITED KINGDOM	33035621
	BALOISE-HOLDING AG	SWITZERLAND	63711969
	SWISS LIFE HOLDING	SWITZERLAND	143526673
	ZURICH INSURANCE GROUP	SWITZERLAND	324302899
	STANDARD LIFE	UNITED KINGDOM	239761143
	SHIN KONG FINL.HLDG.	TAIWAN	64623125
	ACE	SWITZERLAND	82586000
	AFLAC	UNITED STATES	101039000
	CHUBB	UNITED STATES	50151000
	GENWORTH FINANCIAL	UNITED STATES	111295000
	TRAVELERS	UNITED STATES	104688000
	EULER HERMES GROUP	FRANCE	7404483
	HISCOX	BERMUDA	5733282
	XL GROUP	BERMUDA	44879826

OTHER INSURERS

Name	Country	Assets 2010 YE (USD '000)
ARCH CAP.GP.	BERMUDA	15770792
CINCINNATI FINL.	UNITED STATES	15095000
AMP	AUSTRALIA	82476410
CHALLENGER	AUSTRALIA	17090611
INSURANCE AUS.GROUP	AUSTRALIA	18735042
ADMIRAL GROUP	UNITED KINGDOM	2279765
AMLIN	UNITED KINGDOM	9237019
BEAZLEY	IRELAND	4946640
PORTO SEGURO ON	BRAZIL	8055497
SUL AMERICA UNT	BRAZIL	6509969
E-L FINANCIAL	CANADA	13554996
FAIRFAX FINL.HDG.	CANADA	30314468
INDL.ALL.IN.& FINL.SVS.	CANADA	32792659
INTACT FINANCIAL	CANADA	11811103
CATLIN GROUP	BERMUDA	11806000
CHESNARA	UNITED KINGDOM	7438861
NUERNBERGER BETS.	GERMANY	31840050
WURTTEMBERGISCHE LEB.	GERMANY	41505319
ALM BRAND	DENMARK	9200129
TOPDANMARK	DENMARK	11039415
TRYG	DENMARK	9511345
GRUPO CATALANA OCCIDENTE	SPAIN	11686722
APRIL	FRANCE	1895465
CATTOLICA ASSICURAZIONI	ITALY	25941756
MEDIOLANUM	ITALY	46911913
UNIPOL GRUPPO FINANZIARI	ITALY	73506545
VITTORIA ASSICURAZIONI	ITALY	3547104
MAX INDIA	INDIA	2908440
RELIANCE CAPITAL	INDIA	5716623
T & D HOLDINGS	JAPAN	139563228
JARDINE LLOYD THOMPSON	UNITED KINGDOM	1984725
CHINA TAIPING IN.HDG.	HONG KONG	19630869
CHINA LIFE INSURANCE 'H'	CHINA	206608264
PICC PROPERTY & CLTY.'H'	CHINA	29341125
SAMSUNG FIRE & MAR.IN.	KOREA (SOUTH)	23830851
HYUNDAI MARINE & FIRE IN.	KOREA (SOUTH)	10186551
DONGBU INSURANCE	KOREA (SOUTH)	13263737
LANCASHIRE HOLDINGS	UNITED KINGDOM	2576600
STOREBRAND	NORWAY	69243952
NOVAE GROUP	UNITED KINGDOM	2325611

Other Insurers (Continued)

Name	Country	Assets 2010 YE (USD '000)
UNIQA INSU GR AG	AUSTRIA	39775884
SCB LIFE ASSURANCE	THAILAND	2013043
DISCOVERY	SOUTH AFRICA	1796183
LIBERTY HOLDINGS	SOUTH AFRICA	31916917
MMI HOLDINGS	SOUTH AFRICA	NA
SANLAM	SOUTH AFRICA	48291979
SANTAM	SOUTH AFRICA	2185363
HELVETIA HOLDING N	SWITZERLAND	36315515
SCHWZ.NATIONAL-VERSICH.- GESELL.	SWITZERLAND	7519112
VAUDOISE 'B'	SWITZERLAND	10979703
ST.JAMES'S PLACE	UNITED KINGDOM	41212786
ANADOLU HAYAT EMEKLILIK	TURKEY	3631081
CHINA LIFE INSURANCE	TAIWAN	20430356
FUBON FINL.HLDG.	TAIWAN	108426390
SHIN KONG FINL.HLDG.	TAIWAN	64623125
AMERICAN FINL.GP.OHIO	UNITED STATES	32454000
ASSURED GUARANTY	BERMUDA	19247554
ASSURANT	UNITED STATES	26320588
ARTHUR J GALLAGHER	UNITED STATES	3350800
AXIS CAPITAL HDG.	BERMUDA	16373125
BROWN & BROWN	UNITED STATES	2400814
CNA FINANCIAL	UNITED STATES	54690000
CNO FINANCIAL GROUP	UNITED STATES	31060200
HCC INSURANCE HDG.	UNITED STATES	9064082
HARTFORD FINL.SVS.GP.	UNITED STATES	314621000
LINCOLN NATIONAL	UNITED STATES	193824000
MARKEL	UNITED STATES	10762326
MARSH & MCLENNAN	UNITED STATES	14105000
OLD REPUBLIC INTL.	UNITED STATES	15837400
PROGRESSIVE OHIO	UNITED STATES	21150300
PROTECTIVE LIFE	UNITED STATES	47562786
PARTNERRE	BERMUDA	23349411
EVEREST RE GP.	BERMUDA	18258870
RENAISSANCERE HDG.	BERMUDA	8138278
TORCHMARK	UNITED STATES	16159762
UNUM GROUP	UNITED STATES	57307700
W R BERKLEY	UNITED STATES	17463055
WILLIS GROUP HOLDINGS	UNITED KINGDOM	15840000
WHITE MOUNTAINS IN.GP.	BERMUDA	14034400
ALLEGHANY	UNITED STATES	6354552

APPENDIX B: METHODOLOGY

First consider an 88-day estimation window $[T_0, T_1]$, ending three days before the event and estimate the following model

$$r_{it} = \alpha + \beta r_{Mt} + u_{it} \quad \text{(A1)}$$

The abnormal returns are computed in the event window (T_2, T_3) as

$$ar_{it} = r_{it} - \hat{\alpha} + \hat{\beta} r_{Mt} \quad \text{(A2)}$$

Then they are cumulated over the event window of days ranging from T_2 and T_3, encompassing the event day, as

$$CAR_i(T_2, T_3) = \sum_{t=T_2}^{T_3} ar_{it} \text{(A3)}$$

The BMP test considers first the cumulative returns standardized for an estimate of their standard deviation

$$SCAR_i(T_2, T_3) = CAR_i(T_2, T_3) / S_{CAR_i(T_2, T_3)} \quad \text{(A4)}$$

Where the standard deviation is corrected for the serial dependence that arises in successive prediction errors based on the same parameter estimates as follows

$$S_{CAR_i(T_2,T_3)} = \sqrt{\left(\frac{1}{(T_1 - T_0)} \sum_{t=T_0}^{T_1} ar_{it}^2\right)\left\{(T_3 - T_3) * \left[1 + \frac{(T_3 - T_2)}{(T_1 - T_0)} + \frac{\left(\sum_{t=T_2}^{T_3} r_{Mt} - (T_3 - T_2)\overline{r_M}\right)^2}{\sum_{t=T_0}^{T_1} (r_{Mt} - \overline{r_M})^2}\right]\right\}} \quad \text{(A5)}$$

where $\overline{r_M}$ is the mean of the market return over the estimation sample.

Then the statistics on the cross-section of the N companies belonging to a group is derived as

$$Z = \frac{\sum_{n=1}^{N} SCAR_n(T_2, T_3)}{\sqrt{N} S_{SCAR}} \text{(A6)}$$

where

$$S_{SCAR} = \sqrt{\left[\frac{1}{N-1} \sum_{n=1}^{N} \left(SCAR_n(T_2, T_3) - \frac{1}{N} \sum_{n=1}^{N} SCAR_n(T_2, T_3)\right)^2\right]} \quad \text{(A7)}$$

Z is asymptotically distributed as a standard normal.

However, the BMP test assumes that individual securities are uncorrelated in the cross section, which may not be the case when the event date is the same for all companies. Kolari & Pynnonen (2010) devise a modification of the BMP statistics in order to account for cross-section correlation. The statistics they propose is the following

$$Z_{BMP-KP} = Z_{BMP}\sqrt{\frac{1-\bar{p}}{1+(1+N)\bar{p}}} \qquad \text{(A8)}$$

where $\bar{p}$ is the average cross-sectional correlation coefficient of the residuals of the estimated equation (i.e. the abnormal returns in the estimation period). This statistics is again asymptotically normally distributed under the null hypothesis of no effect.

In the generalised sign (GS) test the null hypothesis is that, within a group, the share of returns having positive sign in the event window is equal to the fraction expected to have that sign, based on the estimation window. For example, considering positive returns

$$\hat{p} = \frac{1}{N}\sum_{n=1}^{N}\frac{1}{((T_1-T_0))}\sum_{t=T_0}^{T_1} S_{nt}\,,\;\; S_{nt} = \begin{cases} 1 \; if \; u_{nt} > 0 \\ 0 \; otherwise \end{cases} \qquad \text{(A8)}$$

The test statistics is based on the normal approximation of a binomial distribution with parameter $\hat{p}$ and reads

$$Z = \frac{N_0 - N\hat{p}}{\sqrt{[N\hat{p}(1-\hat{p})]}} \quad \text{(A9)}$$

where N_0 is the number of securities in the group having on average positive residuals in the estimation windows.

In order to test for negative signs, substitute negative for positive in the definition of S_{nt} and N_0.

APPENDIX C: ROBUSTNESS CHECKS

Table A1: Market model with common world index

	Event	1	2	3	4	5
SII	CAAR	-1.24	3.29	0.81	0.41	-0.90
	BMP-KP	0.12	0.07*	0.10*	0.26	0.03**
	GST	0.16	0.00**	0.36	0.11	0.02**
Non SII	CAAR	-1.02	1.67	0.80	0.18	0.35
	BMP-KP	0.07*	0.29	0.48	0.17	0.24
	GST	0.04**	0.00***	0.03**	0.07*	0.12
OTHER	CAAR	-0.19	0.65	0.89	-0.25	-0.72
	BMP-KP	0.45	0.06*	0.06**	0.37	0.00***
	GST	0.29	0.02**	0.00***	0.38	0.00***
SII-Non SII	dCAAR	-0.22	1.62	0.01	0.23	-1.25
	p-value	0.40	0.02**	0.50	0.34	0.01***
	Wilcoxon	0.44	0.03**	0.50	0.45	0.05***
SII-Other	dCAAR	-1.05	2.64	-0.08	0.66	-0.18
	p-value	0.01***	0.00***	0.34	0.41	0.21
	Wilcoxon	0.02**	0.00***	0.11	0.47	0.22
	KW test	0.09*	0.01***	0.91	0.16	0.01***
EU	CAAR	-0.75	2.25	1.39	1.02	0.43
	BMP-KP	0.35	0.31	0.27	0.08*	0.33
	GST	0.18	0.03**	0.27	0.10*	0.03**
US	CAAR	-1.25	2.24	-0.27	0.23	-0.63
	BMP-KP	0.11	0.43	0.22	0.30	0.16
	GST	0.00***	0.38	0.17	0.01	0.05**
ROW	CAAR	-1.40	1.71	0.76	-0.81	0.16
	BMP-KP	0.50	0.45	0.48	0.40	0.44
	GST	0.04**	0.02**	0.21	0.28	0.25
EU-US	dCAAR	0.50	0.00	1.67	0.79	1.06
	p-value	0.22	0.50	0.04**	0.02**	0.01***
	Wilcoxon	0.08*	0.20	0.05**	0.04**	0.01***
EU-ROW	dCAAR	0.65	0.54	0.63	1.83	0.27
	p-value	0.22	0.26	0.23	0.01***	0.34
	Wilcoxon	0.01***	0.03**	0.01***	0.01***	0.00***
	KW test	0.57	0.78	0.31	0.07*	0.04**

Table A1: Market model with common world index (continued)

	Event	1	2	3	4	5
IAIGs	CAAR	-1.07	2.04	0.80	0.24	0.06
	BMP-KP	0.08*	0.27	0.35	0.22	0.48
	GST	0.03**	0.00***	0.04**	0.05**	0.42
Other	CAAR	0.05	0.77	0.53	-0.33	-0.76
	BMP-KP	0.45	0.06*	0.06*	0.37	0.00***
	GST	0.29	0.02**	0.00***	0.38	0.00***
Reinsurers	CAAR	0.96	-0.36	1.66	1.04	-0.20
	BMP-KP	0.15	0.00***	0.08*	0.08*	0.29
	GST	0.34	0.07*	0.00***	0.02**	0.38
IAIGs-Other	dCAAR	-1.12	1.27	0.27	0.57	0.82
	p-value	0.01***	0.01***	0.32	0.09*	0.01***
	Wilcoxon	0.02**	0.01***	0.32	0.02**	0.01***
IAIGs-Reins	dCAAR	-2.03	2.40	-0.86	-0.80	0.26
	p-value	0.03**	0.06*	0.13	0.22	0.41
	Wilcoxon	0.26	0.14	0.37	0.33	0.44
	KW test	0.04**	0.11	0.26	0.05**	0.10*

Table A2: [-2, 2] Window

	Event	1	2	3	4	5
SII	CAAR	-1.48	3.43	-0.22	-0.30	0.32
	BMP-KP	0.00***	0.05**	0.04**	0.22	0.20
	GST	0.01***	0.01***	0.15	0.45	0.41
Non SII	CAAR	-1.06	2.33	-0.66	0.25	0.32
	BMP-KP	0.14	0.17	0.23	0.19	0.34
	GST	0.01***	0.02**	0.05**	0.05*	0.11
OTHER	CAAR	-0.34	-0.20	-0.22	-0.07	-0.10
	BMP-KP	0.28	0.00***	0.38	0.35	0.03**
	GST	0.02**	0.02**	0.07*	0.23	0.14
SII-Non SII	dCAAR	-0.42	1.10	0.44	-0.55	0.00
	p-value	0.25	0.16	0.31	0.16	0.50
	Wilcoxon	0.19	0.03**	0.07*	0.40	0.18
SII-Other	dCAAR	-1.14	3.63	0.00	-0.23	0.42
	p-value	0.00***	0.00***	0.14	0.31	0.10*
	Wilcoxon	0.03**	0.01***	0.33	0.36	0.13
	KW test	0.01***	0.02**	0.86	0.57	0.15
EU	CAAR	-0.16	-0.66	0.30	0.00	0.27
	BMP-KP	0.33	0.01***	0.34	0.39	0.21
	GST	0.46	0.00***	0.02***	0.10	0.04**
US	CAAR	-1.93	1.92	0.72	1.14	-0.79
	BMP-KP	0.01***	0.45	0.03**	0.03**	0.14
	GST	0.00***	0.00***	0.02**	0.14	0.23
ROW	CAAR	-1.23	1.65	-1.50	-0.50	0.87
	BMP-KP	0.50	0.44	0.48	0.43	0.49
	GST	0.00***	0.17	0.42	0.00***	0.13
EU-US	dCAAR	1.26	1.76	-1.18	-1.18	1.36
	p-value	0.09*	0.18	0.19	0.02**	0.05*
	Wilcoxon	0.11	0.21	0.35	0.13	0.01***
EU-ROW	dCAAR	0.56	2.03	1.04	0.46	-0.30
	p-value	0.30	0.08*	0.14	0.26	0.36
	Wilcoxon	0.01***	0.03**	0.18	0.38	0.00***
	KW test	0.40	0.66	0.29	0.08*	0.04***

Table A2: [-2, 2] Window (continued)

	Event	1	2	3	4	5
IAIGs	CAAR	-1.16	2.59	-0.56	0.12	0.32
	BMP-KP	0.12	0.16	0.15	0.32	0.33
	GST	0.00***	0.00***	0.02**	0.14	0.19
Other	CAAR	-0.31	-0.16	-0.24	-0.10	-0.16
	BMP-KP	0.28	0.00***	0.38	0.35	0.03**
	GST	0.02**	0.02**	0.07*	0.23	0.14
Reinsurers	CAAR	0.62	-2.92	-1.80	0.26	0.59
	BMP-KP	0.36	0.05	0.04	0.29	0.07
	GST	0.34	0.08	0.11	0.01	0.02
IAIGs-Other	dCAAR	-0.85	2.75	-0.32	0.22	0.48
	p-value	0.01***	0.01***	0.15	0.34	0.03**
	Wilcoxon	0.00***	0.10*	0.00***	0.00***	0.24
IAIGs-Reins	dCAAR	-1.78	5.51	1.24	-0.14	-0.27
	p-value	0.17	0.07*	0.14	0.45	0.40
	Wilcoxon	0.44	0.10*	0.20	0.44	0.49
	KW test	0.03**	0.42	0.67	0.16	0.16

REFERENCES

Altavilla, C., Giannone, D., & Lenza, M. (2014). The Financial and Macroeconomic Effects of OMT announcements. *Working paper No 1707, European Central Bank*.

Berdin, E., & Grudl, H. (2015). The Effects of a Low Interest Rate Environment on Life Insurers. *Geneva Papers on Risk and Insurance*(2).

Billio, M., Getmansky, M., Lo, A., & Pelizzon, L. (2012). Econometric measures of connectedness ans systemic risk in the financial and insurance sectors. *Journal of financial economics, 104*(3), 535-559.

Bohemer, E., Musumeci, J., & Poulsen, A. (1991). Event-study Methodology under Conditions of Event-induced Variance. *Journal of Financial Economics*(30), 253-272.

Bongini, P., Nieri, L., & Pelagatti, M. (forthocoming). The importance of Being Sytematically Important Financial Institutions. *Journal of Banking anf Finance*.

Campbell, C., Cowan, A., & Salotti, V. (2010). Multy-country Event-study Methods. *Journal of Banking and Finance*(34), 3078-3090.

Campbell, J., Lo, Y. A., & MacKinlay, A. C. (1997). *The Econometrics of Financial Markets.* Princeton University Press.

Cowan, A. (1992). Nonparametric Event Study Tests. *Review of Quantitative Finance and Accounting*(1), 343-358.

Cummings, j., & Weiss, M. (2013). Systemic Risk in the Insurance Industry. In G. Dionne (A cura di), *Handbook of Insurance* (p. 745-793). Springer.

Cummins, J. D., & Venard, B. (2007). International Insurance Markets; Between Global Dynamics and Local Contingiency-An Introduction. In J. Cummins, & B. Venard (A cura di), *Handbook of International Insurance* (p. 1-24). Springer.

Dewenter, K., & Riddick, L. (2015). *What's the Value of a TBTF Guaranty? Evidence from the G-SIFI Designation fro Insurance Companies.* avaialble at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2547723.

Eling, M., & Pankoke, D. (2014). *Systemic risk in the insurance sector-what do we know?* Working papers in risk management and insurance No 124, Institute of Insurance Economics, University of San Gallen.

Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional Heterschedastcity Models. *Journal of Business and Economic Statistics, 20*(3), 339-350.

Engle, R., Jondeau, E., & Rockinger, M. (2014). Systemic Risk in Europe. *Review of Finance*, 1-46.

Gagnon, J., Raskin, M., Remache, J., & Sack, B. (2011). The Financial Market Effects of the Federal Reserve's Large Scale Asset Purchases. *International Journal of Central Banking, 7*(10), 3-43.

Geneva Association. (2010). *Systemic risk in insurance - an analysis of insurance and financial stability.*

IAIS. (2011). *Insurance and Financial Stability.*

IAIS. (2012a). *Global Systemically Important Insurers: Initial Assessment Methodology.*

IAIS. (2012b). *Globally Systemically Important Insurers: Policy Measures.*

IAIS. (2013). *Macroprudential policy and surveillance in insurance.*

IAIS. (2014a). *Basic Capital Requirement for Global Systemically Important Insurers.*

IAIS. (2014b). Frequently Asked Question fot IAIS Financial Stability and MPS Activities.

Jenkins, P., & Davies, P. J. (2009, November 30). Thirty groups on systemic risk list. *Financial Times*.

Kessler, D. (2013). Why (Re)insurance is Not Systemic. *Journal of Risk and Insurance, 81*(3), 477–488.

Kleinov, J., Nell, T., Rogler, S., & Horsch, A. (fortcoming). The Value of Being Systemically Important: Event Study on Regulatory Announcement for Banks. *Applied Financial Economics*.

Kolari, J., & Pynnonen, S. (2010). Event Study Testing with Cross-Sectional Correlation of Abnormal Returns. *Review of Financial Studies, 23*(11), 3996-4025.

Kothari, S., & Warner, J. (2007). Econometrics of Event Studies. In B. Eckbo (A cura di), *Handbook of Corporate Finance* (Vol. I, p. 3-34). Elsevier.

Masciantonio, S. (2013). Identifying and Tracking Global, EU and Eurozne Systemically Important Banks with Public Data. *Bank of Italy, Occasional Papers*(204).

Masters, B., & Gray, A. (2012, May 31). Regulators target 'systemic' insurers. *Financial Times*.

McKinlay, A. (1997). Event studies in Economics and Finance. *Journal of Economic Literature, XXXV*, 13-39.

Moenninghoff, S., Ongena, S., & Wieandt, A. (forthcoming). The perennial Challenge to Counter Too-Big-to-Fail in Banking: Empirical Evidence from the New International Regulation Dealing with Global Systemically Important Banks. *Journal of Banking and Finance*.

Plantin, C., & Rochet, J. (2007). *When Insurers Go Bust.* Princeton University Press.

Radice, M. P. (2010). Assessing the potential for sytemic risk in the insurance sector. *FINMA Working paper* .

Safa, M., Hassan, M., & Maroney, N. (2013). AIG's announcements, Fed's innovation, contagion and systemic risk in the financial industries. *Applied Financial Economics, 23*(16).

Schäfer, A., Schnabel, I., & Weder di Mauro, B. (2015). Financial Sector Reform After the Crisis: Has Anything Happened? *Review of Finance*(forthcoming).

Schoenmaker, D., Osterloo, S., & Winkels, O. (2008). The Emergence of Cross-Border Insurance Groups with Centralised Risk Management. *The Geneva Papers on Risk and Insurance - Issues and Practice*(33), 530-546.

Schwarcz, D., & Schwarcz, S. L. (2014). Regulating Systemic Risk in Insurance. *University of Chicago Law Review, 81*(4).

Stracca, L. (2013). The Global Effects of the Euro Crisis. *Working paper No 1573, European Central Bank*.

Thimann, C. (2014). *How Insurers Differ from Banks: A Primer on Systemic Regulation.* London School of Economics, SRC Special Paper No 3.

Weiss, G., Bierth, C., & Irresberger, F. (2014). *Systemic Risk of Insurers Around the Globe.* available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2419508.