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"Whatever it takes": An Empirical Assessment of the Value of Policy Actions in Banking*

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Abstract

What types of policy intervention had a greater impact during the financial crisis? By using a detailed dataset of worldwide policy, we answer this question focusing on Global Systemically Important banks (G-SIBs), looking both to stock returns and Credit Default Swap (CDS) spreads reactions. As robustness checks, we also analyze a control sample of 31 large Non-Financial Companies (NFCs). Overall, we show that different policy interventions from governments and central banks have produced diverse market reactions: investors generally appreciate monetary policy interventions for G-SIBs (but not for NFCs) and do not welcome bank failures and bailouts (for both G-SIBs and NCFs).

JEL classification: E52, E58, G14, G21

"ECB is ready to do whatever it takes to preserve the Euro.
And believe me, it will be enough"
Mario Draghi, July 26, 2012

1. Introduction

On July 26, 2012, the Chairman of the European Central Bank (ECB) Mario Draghi delivered his famous statement during a speech at the Global Investment Conference in

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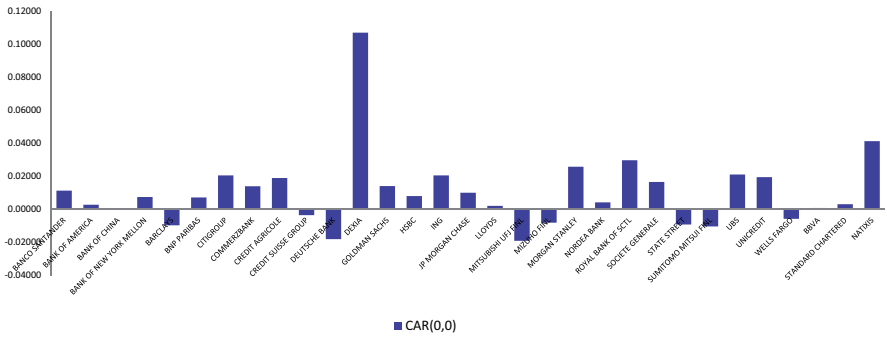

Figure 1. *CARs* for G-SIBs on July 26, 2012. This figure shows results from the event study conducted on July 26, 2012 over all G-SIBs listed in Table III. For Groupe BPCE, we considered the listed controlled company NATIXIS.

London.[1] In the middle of the European sovereign debt crisis, Draghi's speech immediately had a strong impact on European financial markets: Eurostoxx gained 4.3% the day of the speech (8.1% up to the end of July), IBEX 6.1% (13.1% up to the end of July), S&PMIB 5.6% (12.4% up to the end of July), CAC40 4.1% (7.1% up to the end of July), and DAX 2.8% (6.0% up to the end of July). To provide a more accurate assessment of the impact of Draghi's speech on a global basis, we ran an event study around July 26, 2012:[2] in Figure 1, we report the estimated Abnormal Returns (ARs) around Draghi's speech, focusing on Global Systemically Important Banks (G-SIBs). Our estimates clearly show that financial markets fully believed in the ECB President statement: ARs were substantial not only for most European banks, but also for institutions located in other currency areas (e.g., USA). In terms of value (i.e., the product of registered abnormal returns and market capitalization), shareholders of European banks gained more than 2 EUR billion. Banks located in other currency areas also registered a strong positive reaction, providing evidence in favor of financial markets globalization.

Although Draghi's speech was not a monetary policy intervention (in the strict sense), it is a vivid example that financial markets give great attention to any action (even nonconventional) undertaken by policymakers to reduce risk and uncertainty in financial markets. Indeed, policymakers throughout the world have run a wide set of policy interventions using new instruments and techniques to restore the stability of the financial and banking systems following the financial crisis. At the beginning of the financial crisis in 2007, central banks' interventions aimed to contain it seemed to be working. Although the losses in the subprime mortgage market were substantial, they still seemed manageable and most policymakers hoped that the worst was over and that the financial system would begin to recover (Mishkin, 2010). However, a tremendous set of shocks was recorded in September 2008, such as the Lehman Brothers and AIG collapses, and the run of the Reserve Primary Fund (Mishkin, 2010). From that moment, the financial crisis evolved into a global crisis, generating severe economic contraction.

1 The text of Draghi's speech is available at http://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html

2 For further details about our empirical approach, see Section 3.1 "Estimating abnormal returns for stock prices".

The central questions are now: what types of policymakers' interventions have a greater impact on the banking sector during the financial crisis? Do all G-SIBs have a similar sensitivity to these interventions? Are there significant differences across the main currency areas (e.g., Euro Area [EUR] versus United States [USA])? Do large Non- Financial Companies (NFCs) have a similar reaction of G-SIBs to policy interventions? Our article aims to answer these questions by assessing the market reaction to a detailed set of policy interventions undertaken during the financial crisis (i.e., 1,322 policy interventions made between June 1, 2007 and June 30, 2012). We have four major results. First, policy interventions by governments and central banks have produced a very heterogeneous market reaction for G-SIBs' stock prices and Credit Deafult Swap (CDS) spreads, with some significant differences across types of intervention and geographic regions. At the opposite extreme, the effect on the NFCs stock price is generally negative, probably indicating that investors have perceived these interventions as exclusively in favor of banks, or coming from a worsening in the economic outlook. Second, for both G-SIBs and NFCs, investors do not welcome bank failures and bailouts, suggesting that they prefer action rather than inaction (or late action) by authorities when facing a period of crisis. Third, the effect of announcing measures to support the financial industry is diverse across regions (i.e., more positive in the EUR and less in the USA), reflecting a different sentiment for public aid to banks. Finally (fourth), the model that considers only domestic interventions shows a higher explanatory power than the one including all measures around the world. Despite the international character of G-SIBs, these banks are not found to be equally responsive to all global interventions, but are probably more sensitive to policy interventions announced in their own currency area.

The focus of our article is on the G-SIBs (as released by the FSB on November 4, 2011 and then updated in November 2012), since these are the largest and most interconnected banks on the global scene and financial stability cannot be assured without the stability of each of these banks. In addition, all G-SIBs are listed banks, so that the effect of policy interventions on financial stability can be assessed by estimating the stock market reaction (focusing on Cumulative Abnormal Returns [*CARs*]) around the announcement date of each policy intervention. We also aim to analyze the effect on the G-SIBs' default risk perceived by investors; as such, we assess the CDS market response calculating the CDS spread change for all G-SIBs over a short period around the announcement. Finally, to shed some light on the effect on the whole economy (not only the financial services industry), we also analyze the policy effect on a sample of 31 NFCs based on the FT Global 500 list of the world's largest companies in 2007, ranked on market capitalization at the beginning of the period investigated.

We adopt the event study approach since it provides us with an accurate identification strategy, considering the very large number of policy actions investigated (i.e., 1,322 policy interventions in five years). As outlined by Bernanke, Reinhart, and Sack (2004), by using sufficiently narrow event windows, the event study provides a precise estimate of the market's response to central bank announcements. A similar perspective is expressed in various studies (e.g., Gagnon et al., 2011; Swanson, Reichlin, and Wright, 2011; Fiordelisi, Galloppo, and Ricci, 2014), which state that under the assumption of market efficiency, the intervention's effects occur when investors update their expectations, and not when actual measures are implemented, and that a one- or two-day estimation window is sufficient to provide an unbiased estimate of the complete effect of the announcement. As such, and consistent with Jawadi, Arouri, and Nguyen (2010), we adopt a short-run perspective (i.e., one

day before and one day after the announcement) and consider each announced intervention as effective, based on the accuracy and rapidity of market reactions in the direction expected by policymakers.

The remainder of the article is organized into the following sections. Section 2 reviews previous papers, highlights our contribution, and discusses our research hypotheses. Section 3 contains a description of the collection procedure we followed to create a unique dataset of worldwide policy interventions. It also illustrates our econometric approach, Section 4 presents the empirical results, and Section 5 concludes.

2. Literature, Contributions, and Hypotheses

Our article brings together two strands of the literature. The first is the literature assessing the impact of monetary policy interventions on stock market prices and volatility (Bomfin, 2003; Ehrmann and Fratzscher, 2004; Bernanke and Kuttner, 2005; Chulià, Martens, and van Dijk, 2010; Rangel, 2011; Rosa, 2011), international bond returns (Bredin, Hyde, and Reilly, 2010), interest rates (Hausman and Wongswan, 2011; Leòn and Sebestyén, 2012), and exchange rates (Hausman and Wongswan, 2011). This literature has largely expanded during the past decade. Most papers (Bomfin, 2003; Ehrmann and Fratzscher, 2004; Bernanke and Kuttner, 2005; Chulià, Martens, and van Dijk, 2010; Hausman and Wongswan, 2011; Rangel, 2011; Rosa, 2011) focus on the USA to assess how the central banks' intervention on interest rates relates to asset prices, while there are very few papers dealing with other currency areas. Bredin, Hyde, and Reilly (2010) consider the impact and spillover effects of monetary policy surprises on international bond returns in the UK, the USA, and the EUR. Jawadi, Arouri, and Nguyen (2010) investigate the relationship between changes in the 3-month interest rate and the closing price of CAC 40, Dow Jones, and FTSE 100 indices (for France, USA, and UK, respectively). Leòn and Sebestyén (2012) analyze the impact of the ECB monetary policy surprises on interest rates. While there is a large body of literature assessing the effect of traditional monetary policy interventions, there is little dealing with nonconventional measures. An exception is the work of Aït-Sahalia et al. (2010, 2012), which considers both conventional and nonconventional measures and compares their impact on the 3-month LIBOR–Overnight Indexed Swap (OIS) spread.

The second strand of literature assesses the effectiveness of policy responses to the global financial crisis. The number of studies is much smaller than for the former literature strand, with empirical analyses generally quite narrow in scope and focusing on single measures in specific markets. For example, McAndrews, Sarkar, A. and Wang (2008) examine the effectiveness of the Federal Reserve's Term Auction Facility (TAF) in mitigating liquidity problems in the interbank funding market, while Baba and Packer (2009) analyze the effect of the swap lines among Central Banks in reducing the dollar shortage problem. Meaning and Zhu (2011) explore the impact of the recent purchases of Treasury securities by the Federal Reserve and of gilts by the Bank of England on government bond yields. A more recent study by Pennathur, Smith, and Subrahmanyam (2014) examines the market reaction to nine US government interventions in response to the crisis for different categories of financial institutions (banks, savings and loan associations, insurance companies, and real estate investment trusts). The authors find that these measures generally produce an increase in risk and a reduction in value.

The starting point for our research is the work by Aït-Sahalia et al. (2010, 2012): in comparison with other studies which investigate policy responses to the financial crisis, this

article has the merit of assessing the effect on the banking sector of a wide set of policy interventions in various countries. Specifically, Aït-Sahalia et al. (2012) examines the effect of policy announcements (fiscal and monetary policy, liquidity support, financial sector policy, and ad hoc bank failures) on the interbank credit and liquidity risk premia in the USA, the EUR, the UK, and Japan between June 2007 and March 2009. The authors assess the policy effect on the day-to-day changes in the 3-month LIBOR–OIS rate spread (the authors consider the LIBOR–OIS spread as a proxy for the liquidity and counterparty risk premia in the global interbank markets). In summary, the authors show that policy announcements were usually associated with reductions in the LIBOR–OIS spreads, but no policy action is better than the others to contain the crisis. A more recent study by Fiordelisi, Galloppo, and Ricci (2014) investigates the impact of both conventional and nonconventional monetary policy interventions on the interbank market, on equity indices, and on the stock price of G-SIBs between June 2007 and June 2012, finding that nonconventional interventions were more effective than standard interest rate decisions in generating positive price reactions for G-SIBs. Nevertheless, this article does not consider policy interventions that are different from monetary policy decisions, such as support measures to the whole financial sector (e.g., the Troubled Asset Relief Program in the USA), or other relevant events, such as failures and bailouts.

Overall, our article can broadly be categorized as an exploration and extension of the literature on the risk-taking channel of monetary policy (for some papers in that vein, see Borio and Zhu, 2012; Dell'Ariccia, Laeven, and Suarez, 2013; Gertler and Karadi, 2013; Hanson and Stein, 2015; Gertler and Karadi, 2015). In our article, risk appetite could be interpreted as being linked to the market value of equity of the G-SIBs under review, and the monetary and financial support policies that are considered are tested for their effects on equity values.[3] Our article contributes to the previous literature in several ways. First and foremost, our article analyzes a large set of policy interventions in the credit industry during the whole of the crisis. In addition, we provide novel evidence, since we extend Aït-Sahalia et al. (2012) along three important paths: the time period analyzed, how the effect of policy interventions on the credit industry is captured, and the differences across currency areas.

First, we extended the time period analyzed from June 2007 to 2012. This extension is crucial in the light of recent events revealing that the global financial crisis did not end in 2009, as Aït-Sahalia et al. (2012) supposed. By including three more years of observation, we are also able to cover the Euro sovereign debt crisis. The time period analyzed is the same period investigated by Fiordelisi, Galloppo, and Ricci (2014), but we consider a wider range of policy interventions, not limited to monetary policy decisions. To ensure consistency with previous papers, policy interventions have been classified in several macro categories, similar to those defined by Aït-Sahalia et al. (2012): monetary policy, financial sector policy, ad hoc bank bailouts and failures, and other measures (see Section 3 for more details).

Second, to capture the effect of policy interventions on the banking sector, we do not focus our investigation on the interbank market, measuring the impact on the LIBOR–OIS spread (as in Aït-Sahalia et al., 2012). Instead, we focus on the banking system by considering the stock price and CDS reaction of G-SIBs. We believe this is quite novel to the literature and provides a relevant contribution to understand the effectiveness of governments' response to the financial crisis. While there is substantial literature assessing the effect of

3 We would like to thank an anonymous referee for this suggestion.

interest rate decisions on stock markets, there is a lack of studies on both the effect of nonconventional monetary policy interventions (such as monetary easing and liquidity support decisions) and policymakers' interventions other than monetary ones. To our knowledge, the only papers assessing the effectiveness of policy interventions on risk and return of banks are Panetta et al. (2009), Pennathur, Smith, and Subrahmanyam (2014), and Fiordelisi, Galloppo, and Ricci (2104). Panetta et al. (2009) investigate government rescue plans, finding no evidence of a positive stock price reaction. In their opinion, results are probably explained by concerns about the dilution of shareholders' rights, public intervention in bank management, and uncertainty regarding the duration of the plan. Looking at the impact on the CDS market, results are more favorable to government interventions, showing that the announcement of system-wide rescue packages was followed by a fall in CDS premia, especially for announcements of capital injections. Pennathur, Smith, and Subrahmanyam (2014) take into account only nine announcements of post-crisis measures in the USA, finding that, with the exception of the Troubled Asset Relief Program (TARP), the interventions were wealth decreasing and risk increasing for financial institutions. Fiordelisi, Galloppo, and Ricci (2014) consider only monetary policy interventions, finding that nontraditional measures have registered a stronger stock price reaction with respect to standard interest rate decisions. Nevertheless, the recent global financial crisis has also been a period of unprecedented intensity for policymakers' interventions other than monetary ones. These other types of intervention (such as recovery measures for the whole financial sector or for single banking institutions) have rarely been explored in the financial literature because they were rare and circumscribed events. Furthermore, the crisis has revealed a strong interconnection between the real economy, public finance, and stability in the financial markets, so we believe it is important to consider financial sector policies implemented by governments to support banks.

Third, we also consider potential differences across several currency areas—whereas most studies (e.g., Pennathur, Smith, and Subrahmanyam, 2014) focus on a specific geographic area. This allows us to assess whether global banks respond to all policymakers' interventions in the same way, regardless of the specific geographic area where they are located and the stock market where they are listed.

The main research hypothesis investigated here concerns the effect produced by each policy intervention considered during the financial crisis. Specifically, we posit that each intervention made during the crisis created value for investors. This means that, once policymakers announce an intervention, AR for banks' stocks increase. The underlying idea is that the announcement of a "successful" policy intervention has: (i) a general impact on the economy of a country captured by the country's stock index reaction; and (ii) a specific impact on the stock return of a specific company, due to the idiosyncratic characteristics of the company itself that make its stock reaction different from the market's. As such, a policy intervention increases the net expected present value of a single stock more than the mean of companies included in the market portfolio, so that it generates positive ARs. A policy intervention can increase the net expected present value of bank stocks for several reasons. First, the intervention may directly or indirectly reduce interest rates (and therefore the cash flows' discount rate). Second, the intervention may reduce the probability of default of the G-SIBs or risk premia demanded by investors. Third, the intervention may also improve the value of future cash flows produced by banks. We are not interested in investigating the reasons behind the abnormal return; our aim is to identify which policy interventions have produced a positive impact on the systemic bank, in terms of "specific"

reactions. However, the analysis of the impact on the CDS market may provide some useful insights regarding changes in the banks' default risk perceived by investors and hence on the possible weight of increasing risk premia in determining stock returns. Similarly, our main interest is for the effect of policy interventions on the financial services industry; however, we also measure the impact on a control sample of large NFCs.

Finally, we also test whether all G-SIBs respond to policy interventions in a similar way, or whether there are significant differences depending on their location in a specific currency area.

3. Collecting Policy Interventions

We analyze policymakers' interventions in five main currency areas:[4] the EUR, UK, USA, Switzerland (CH), and Japan (JPN); we also collect some policy interventions announced in other countries, treated as a residual category. We consider a 5-year investigation period, from June 2007 to 2012, covering three different subperiods. Consistent with Aït-Sahalia et al. (2010, 2012), the first period is between June 1, 2007 and September 14, 2008 (i.e., the day before the collapse of Lehman Brothers), labeled as the "subprime crisis phase". The second period runs from September 15, 2008 to May 2, 2010, when the Eurozone members and the International Monetary Fund agreed to a bailout package to rescue Greece for €110 billion. We label this subperiod the "global financial crisis". The third period, labeled the "sovereign debt crisis", runs from May 3, 2010 to the end of the investigated period.

Overall, we collected 1,322 policy interventions from different sources. For the period June 2007–March 2009, we draw information from the database compiled by the National Bureau of Economic Research (Aït-Sahalia et al., 2010, 2012). For the period from April 2009 to the end of June 2012, we collect data from official announcements (in the form of press releases) from the European Central Bank, Bank of Japan, Bank of England, Federal Reserve, and Swiss National Bank. We also draw information from other sources: Factiva, Federal Reserve Bank of St. Louis, Bank for International Settlement, Lauder Institute—Wharton School—University of Pennsylvania, Bank of Ireland, Institut für Bankrecht (IBR) Universitat Bern, and Mayer Brown LTD.

Policy interventions have been classified into the following macro categories (consistent with Aït-Sahalia et al., 2012): monetary policy, financial sector policy, ad hoc bank bailouts and failures, and other measures (including stimulus and austerity packages, administrative measures, restrictions on short selling, and other announcements that do not belong to previous categories but are believed to generate a significant market reaction). For each of these macro-categories, we have identified some micro-categories of policy interventions. Table I summarizes all of the variables used in the article and Table II illustrates our classification of policy interventions, the description of each macro- and micro-category, and the source of information.

One of the main problems in assessing the impact of policy interventions is to deal with overlapping events. A first intuitive solution would be to set subjective criteria and then

4 We would like to thank an anonymous referee for suggesting to exclude the Asian experience (i.e., Japan) in order to have more homogeneous currency areas. We run all models without Asia and results remain substantially unaltered. These results are available for readers from the authors upon request.

Table I. Variables' description

This table lists all variables used in the article.

Variables	Symbol	Description
Cumulated Abnormal Returns	*CAR*	Cumulated abnormal returns estimated with a simple market model over a 252-day estimation period that ends 20 days before the announcement.
Market-adjusted returns	*MAR*	Cumulated market-adjusted returns measured as the simple difference between the stock and the market index returns.
Change in CDS spreads	Δ*CDS*	Change in 5-year senior *CDS* spreads (simple difference in basis points).
Expansionary monetary policy	*MON_POL_EXP*	Expansionary measures are classified in Interest rates cut (*IR_CUT*), Liquidity provision (*LIQ+*), and Monetary Easing (*MON_EASE*).
Restrictive monetary policy	*MON_POL_RES*	Restrictive measures are classified in Interest rates increased or unchanged (*IR_UNC/INC*), and Liquidity reduction (*CONTR*).
Interest rates cut	*IR_CUT*	*IR_CUT* indicates interest rate cuts.
Liquidity provision	*LIQ+*	*LIQ+* indicates liquidity provision, in both domestic and foreign currencies.
Monetary easing	*MON_EASE*	*MON_EASE* indicates monetary easing interventions.
Interest rates increased or unchanged	*IR_UNC/INCR*	*IR_UNC/INCR* indicates interest rates increased or unchanged.
Liquidity reduction	*CONTR*	*CONTR* indicates liquidity drain or end/reduction of monetary easing programs.
Financial support	*FIN_SUPPORT*	*FIN_SUPPORT* includes all instruments used to resolve systemic banking crises. We distinguish three types of interventions: Asset Support (*FIN_ASSET*), liability support (*FIN_LIABL*), and equity support (*FIN_RECAP*).
Financial support on assets	*FIN_ASSET*	*FIN_ASSET* includes recovery measures for banks in the form of asset purchase or ring-fencing of bad assets and asset guarantees.
Financial support on liability	*FIN_LIABL*	*FIN_LIABL* includes recovery measures for banks in the form of guarantees for old or new liabilities, enhancement of depositor protection schemes, and provision of lender of last resort facilities.
Financial support on equity	*FIN_RECAP*	*FIN_RECAP* includes capital injections and nationalization (acquisition of controlling share).
End of Financial Support	*END_FIN_SUPPORT*	*END_FIN_SUPPORT* includes the end of an instrument used to resolve systemic banking crises. We distinguish the end of three types of interventions: Asset Support (*FIN_ASSET-*), liability support (*FIN_LIABL-*), and equity support (*FIN_RECAP-*).

(continued)

Table I. Continued

Variables	Symbol	Description
End of financial support on assets	*FIN_ASSET-*	*FIN_ASSET-* includes the end of recovery measures for banks in form of asset purchase or ring-fencing of bad assets and asset guarantees.
End of financial support on liability	*FIN_LIABL-*	*FIN_LIABL-* includes the end of recovery measures for banks in form of guarantees for old or new liabilities, enhancement of depositor protection schemes, and provision of lender of last resort facilities.
End of financial support on equity	*FIN_RECAP-*	*FIN_RECAP-* includes the end of capital injections and nationalization (acquisition of controlling share).
Bailouts and failures	*INACTION*	*INACTION* includes decisions allowing single banks to fail or bailout. We distinguish two cases: bank bailouts and assisted mergers (*INA_BAIL*) and bank failures (*INA_FAIL*).
Bailouts and assisted mergers	*INA_BAIL*	*INA_BAIL* indicates bank bailouts and assisted mergers.
Bank failures	*INA_FAIL*	*INA_FAIL* indicates bank failures.
Other measures	*OM*	*OM* is a residual category including stimulus and austerity packages, administrative measures, restrictions on short selling and other announcements that do not belong to previous categories but are believed to generate a significant market reaction. This is omitted in our models to avoid multicollinearity.
Worldwide intervention	*WORLD*	*WORLD* is a dummy variable equal to one if there is an intervention announced in the rest of the world (i.e., in a different currency area).
Multiple intervention	*MULT*	*MULT* is a dummy variable equal to one if more than one measure is announced in the same date.

select the most relevant events while dropping those overlapping in the same time period. However, this approach is unsuitable for us because we would lose a large number of observations due to the large number of policy interventions during the financial crisis, often occurring within a very short time. Second, any criteria would imply an arbitrary evaluation of the relative importance of two or more close policy interventions, and that may alter the results. As a consequence, we prefer to keep all policy interventions in our sample, then estimate the ARs for each G-SIB for every single day of the investigated period in which at least one policy intervention was announced; and finally, account for the overlapping effect by including dummy variables for each macro- and micro-category of policy intervention. Specifically, in the second step of our analysis, when we investigate the determinants of the market reaction with a multivariate regression, we check for any overlapping of different types of intervention using a set of dummies (see Section 3.2 for more details about our econometric approach).

A problematic issue is the effective surprise content of policy announcements. Most papers dealing with the impact of monetary policy decisions on the stock market

Table II. Policy announcements between June 2007 and 2012—Sample description

This table lists all policy interventions during June 2007– 2012. For the period June 2007–March 2009, we draw information from the database compiled by the National Bureau of Economic Research (Aït-Sahalia et al., 2010, 2012). For the period from April 2009 to the end of June 2012, we collect data from the European Central Bank, Bank of Japan, Bank of England, Federal Reserve, Swiss National Bank, Factiva, Federal Reserve Bank of St. Louis, Bank for International Settlement, Lauder Institute—Wharton School—University of Pennsylvania, Bank of Ireland, InstitutfürBankrecht (IBR) Universitat Bern, and Mayer Brown LTD. Monetary Policy includes both expansionary and restrictive measures taken by Central Banks. *IR_CUT* indicates interest rate cuts; LIQ+ indicates liquidity provision, in both domestic or foreign currencies; *MON_EASE* indicates monetary easing interventions. *IR_UNC/INCR* indicates interest rates increased or unchanged; *CONTR* indicates liquidity drain or end/reduction of monetary easing programs. Financial Support includes all instruments used to resolve systemic banking crises. *FIN_ASSET* includes recovery measures for banks in form of asset purchase or ring-fencing of bad assets and asset guarantees; *FIN_LIABL* includes recovery measures for banks in the form of guarantees for old or new liabilities, enhancement of depositor protection schemes, and provision of lender of last resort facilities; *FIN_RECAP* includes capital injections and nationalization (acquisition of controlling share). End of Financial Support includes the end of the Financial Support measures (*FIN_ASSET-*; *FIN_LIABL-*; and *FIN_RECAP-*). Bailouts and failures includes decisions allowing single banks to fail or bailout. INA_BAIL indicates bank bailouts and assisted mergers; INA_FAIL indicates bank failures. Other measures are residual category.

	Stage 1—Subprime financial crisis (1/06/2007–14/09/2008)							Stage 2—Global financial crisis (15/09/2008–2/05/2010)							Stage 3—Sovereign debt crisis (3/05/2010–30/06/2012)							Overall
	CHE	EUR	JPN	UK	US	Other	Tot1	CHE	EUR	JPN	UK	US	Other	Tot2	CHE	EUR	JPN	UK	US	Other	Tot3	
Expansionary monetary policy																						
IR_CUT	0	0	0	3	7	0	10	5	7	2	6	3	0	23	2	2	1	0	0	0	5	38
LIQ+	2	11	0	2	27	0	42	5	15	22	6	52	0	100	1	17	9	0	0	0	27	169
MON_EASE	0	0	0	0	0	0	0	0	2	9	11	4	0	26	0	3	27	2	1	0	33	59

(continued)

Table II. Continued

	Stage 1—Subprime financial crisis (1/06/2007–14/09/2008)							Stage 2—Global financial crisis (15/09/2008–2/05/2010)							Stage 3—Sovereign debt crisis (3/05/2010–30/06/2012)							Overall
	CHE	EUR	JPN	UK	US	Other	Tot1	CHE	EUR	JPN	UK	US	Other	Tot2	CHE	EUR	JPN	UK	US	Other	Tot3	
Restrictive monetary policy																						
IR_UNC/INCR	5	12	17	13	4	0	51	5	12	26	13	12	0	68	9	24	25	26	17	0	101	220
CONTR	0	0	0	0	0	0	0	0	3	0	0	7	0	10	0	0	1	1	17	0	19	29
Financial support																						
FIN_ASSET	0	1	0	0	2	0	3	4	12	0	9	24	2	51	0	0	0	0	0	0	0	54
FIN_LIABL	0	1	0	9	1	5	16	1	44	3	13	25	19	105	0	12	0	1	5	2	20	141
FIN_RECAP	0	0	0	0	0	2	2	0	43	5	6	72	11	137	0	4	2	0	2	0	8	147
End of Financial support																						
FIN_ASSET-	0	0	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	0	4	0	4	9
FIN_LIABL-	0	0	0	0	0	0	0	1	0	0	2	3	0	6	0	1	0	0	0	0	1	7
FIN_RECAP-	0	0	0	0	0	0	0	2	3	0	0	42	0	47	0	0	0	0	47	0	47	94
Bail-outs and failures																						
INA_BAIL	0	3	0	2	5	0	10	1	8	0	4	12	0	25	0	3	0	1	1	0	5	40
INA_FAIL	0	0	0	0	2	0	2	0	1	0	1	1	0	3	0	0	0	0	0	0	0	5
Other measures	2	10	0	11	36	1	60	1	58	20	22	71	9	181	0	49	7	1	10	2	69	310
Total	9	38	17	40	84	8	196	25	208	87	93	333	41	787	12	115	72	32	104	4	339	**1,322**

(e.g., Bomfin, 2003; Ehrmann and Fratzscher, 2004; Bernanke and Kuttner, 2005) distinguish between the expected and the unexpected interest rate changes. Nevertheless, as outlined by Aït-Sahalia et al. (2012), information about the expected and officially announced intensity of policy announcements is available only for some kinds of events (especially conventional monetary policy) and for some countries (especially UK and USA). Consequently, we do not disentangle expected from unexpected changes to avoid subjective classification of policy interventions.

3.1 Estimating Abnormal Returns for Stock Prices

We measure the market reaction of G-SIBs and NFCs by estimating ARs as the difference between actual stock returns and expected returns (i.e., those expected in the absence of relevant events).

We select stock price time series for each of the 31 G-SIBs listed in Panel A of Table III. We consider the banks included in the 2011 list but excluded from the 2012 update as level 1 banks. We also selected a control sample of 31 NFCs (reported in Panel B of Table III), based on the FT Global 500 list of the world's largest companies in 2007, ranked on market capitalization. We selected companies to replicate the geographical composition of the sample of G-SIBs. Then, we used the control sample to conduct similar tests to see how their *CARs* compare with the G-SIBs'.

There are several ways of measuring expected returns (see, e.g., Kothari and Warner, 2006). In our main models, we estimate the ARs by adopting the market model (MacKinlay, 1997). Normal returns for every i-th observation (R_{it}) are obtained as a function of the market portfolio return (R_{Mt}), represented by a world equity index (MSCI World Index):

$$R_{it} = \alpha_i + \beta_i R_{Mt} + \varepsilon_{it} \qquad E(\varepsilon_{it}) = 0,\ \mathrm{var}(\varepsilon_{it}) = \sigma^2_{\varepsilon i} \tag{1}$$

Market model parameters are obtained with daily log returns of G-SIBs stock prices over a 252-day estimation period that ends 20 days before the announcement. ARs are then calculated as the difference between the actual stock return and the return predicted by the market model:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{Mt}) \tag{2}$$

ARs are then cumulated over a time period around the announcement date ($t = 0$) to compute the *CAR*. Consistent with Aït-Sahalia et al. (2010, 2012) and Fiordelisi, Galloppo, and Ricci (2014), we focus on very short event windows to limit the problem of overlapping events. Specifically, we measure the cumulative effect of the policy from the day before the announcement to the day following the announcement [i.e., *CAR* (−1,+1)].[5] *CARs* are obtained as follows:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \tag{3}$$

5 We would like to thank an anonymous referee for this suggestion. As a robustness check, we also estimated CARs over the following event windows: (−1,0), (0,0), and (0,+1). Results are available on request from the authors.

Table III. Sample description

Panel A reports the list of the G-SIBs released by the Financial Stability Board on November 4, 2011. The list has been updated on November 1, 2012. Compared with the group of G-SIBs published in 2011, two banks have been added (BBVA and Standard Chartered) and three banks removed (Dexia, Commerzbank, and Lloyds), as a result of a decline in their global systemic importance. Given that the observed period is 2007–12, we considered also the institutions that have been removed in November 2012, leaving a total sample of 31 large banks. For Groupe BPCE we considered the listed controlled company NATIXIS. Source: Financial Stability Board (2011, 2012).

Panel B reports the list of NFCs included in our analysis. We selected 31 companies based on the FT Global 500 list of the world's largest companies in 2007 ranked by market capitalization. Companies are selected to replicate the geographical composition of the sample of G-SIBs. Source: Financial Times (2007).

Panel A—Global Systemically Important Banks

Bank	Country	Currency area
Credit Suisse Group	CH	CH
UBS	CH	CH
DEXIA	BEL	EUR
COMMERZBANK	GER	EUR
DEUTSCHE BANK	GER	EUR
GROUPE BPCE	FRA	EUR
BNP PARIBAS	FRA	EUR
CREDIT AGRICOLE	FRA	EUR
SOCIETE GENERALE	FRA	EUR
UNICREDIT	ITA	EUR
ING	NED	EUR
BANCO SANTANDER	ESP	EUR
BBVA	ESP	EUR
MITSUBISHI UFJ FINL	JPN	JPN
MIZUHO FINL	JPN	JPN
SUMITOMO MITSUI FINL	JPN	JPN
HSBC	UK	UK
LLOYDS	UK	UK
BARCLAYS	UK	UK
ROYAL BANK OF SCTL	UK	UK
STANDARD CHARTERED	UK	UK
CITIGROUP	US	US
BANK OF NEW YORK MELLON	US	US
GOLDMAN SACHS	US	US
JP MORGAN CHASE	US	US
MORGAN STANLEY	US	US
STATE STREET	US	US
BANK OF AMERICA	US	US
WELLS FARGO	US	US
BANK OF CHINA	CHI	Other
NORDEA	SWE	Other

(continued)

Table III. Continued

Panel B—Non-Financial Companies		
Firm	Currency area	Industry
Nestle	CH	Food Producers
Roche	CH	Pharmaceuticals & Biotechnology
Total	EUR	Oil & Gas Producers
EDF	EUR	Electricity
ENI	EUR	Oil & Gas Producers
Sanofi-Aventis	EUR	Pharmaceuticals & Biotechnology
Telefonica	EUR	Fixed Line Telecommunications
Unilever	EUR	Food Producers
Siemens	EUR	Electronic & Electrical Equipment
Arcelor Mittal	EUR	Industrial Metals
Nokia	EUR	Technology Hardware & Equipment
E.ON	EUR	Gas, Water & Multiutilities
DaimlerChrysler	EUR	Automobiles & Parts
Toyota Motor	JPN	Automobiles & Parts
NTT DoCoMo	JPN	Mobile Telecommunications
Nippon Telegraph & Telephone	JPN	Fixed Line Telecommunications
Royal Dutch Shell	UK	Oil & Gas Producers
BP	UK	Oil & Gas Producers
GlaxoSmithKline	UK	Pharmaceuticals & Biotechnology
Vodafone	UK	Mobile Telecommunications
AstraZeneca	UK	Pharmaceuticals & Biotechnology
Exxon Mobil	US	Oil & Gas Producers
General Electric	US	General Industrials
Microsoft	US	Software & Computer Services
Procter & Gamble	US	Household Goods
Wal-Mart Stores	US	General Retailers
Altria	US	Tobacco
Pfizer	US	Pharmaceuticals & Biotechnology
Johnson & Johnson	US	Pharmaceuticals & Biotechnology
Sinopec	Other	Oil & Gas Producers
Ericsson	Other	Technology Hardware & Equipment

where t_1 and t_2 are the starting and the ending date of the considered window. ARs can be aggregated on a time or a cross section basis for a portfolio of N observations. The Cumulative Average Abnormal Return (CAAR) is calculated as:

$$CAAR(t_1, t_2) = \frac{1}{N}\sum_{i=1}^{N} CAR_i(t_1, t_2) \tag{4}$$

As a robustness check, various recent papers (e.g., Madsen and Zachariah, 2015) use both the market model and the market-adjusted method, in which expected returns are set equal to the market portfolio returns on the days of interest, and hence abnormal returns are simply the difference between the actual stock return and the market portfolio return

in the same day. Simple market-adjusted returns around the announcement date are particularly useful in the absence of convincing evidence of which is the most appropriate model for estimating abnormal returns (e.g., Draper and Paudyal, 2008; Gregory and O' Donohoe, 2014), or when available data do not allow estimation of "uncontaminated risk parameters" (e.g., because relevant events are likely to be included in the estimation period, rendering the beta estimation less meaningful, as outlined by Fuller, Netter, and Stegemoller, 2002). The market-adjusted method has been used in past papers dealing with crisis periods (e.g., Kutan, Muradoglu, and Sudjana, 2012), during which the estimation window is likely to have different characteristics and risk-return dynamics with respect to the event window. In our setting, the estimation period is likely to be contaminated by relevant events, especially for G-SIBs (i.e., when calculating market model normal returns for events in 2011, we use daily returns from 2010, which are already contaminated by policy announcements). As such, to strengthen our results, we calculate G-SIBs and NFCs abnormal returns using both the market model and the market-adjusted approach. By measuring abnormal returns as a simple difference between the actual stock return and the market portfolio return in the same day, we can take into account that risk parameters may be unstable during the observed period, so that using estimates from the estimation period to calculate normal returns in the event window may have produced a bias in the market model estimates.

To fully assess the effect of policy interventions on the banking industry, we also consider the impact on G-SIBs' CDS spreads. Like previous literature (e.g., Afonso, Furceri, and Gomes, 2012), we consider CDS spreads for 5-year senior debt, drawn by the Bloomberg database. Specifically, we measured CDS spread changes over the same event window used for the stock price analysis $(-1,+1)$, that is also common in the CDS literature (e.g., Ismailescu and Kazemi, 2010; Afonso, Furceri, and Gomes, 2012). As such, the CDS spread change is calculated as the difference between the CDS spread at time $t+1$ and the CDS spread at time $t-1$, where t is the policy intervention announcement day.

3.2 Econometric Approach

The main research hypothesis investigated in the article concerns the effect of each policy intervention considered during the financial crisis, that is, the announcement of a policy intervention increases AR for G-SIBs. After estimating *CARs*, we run a multivariate regression model to link policy interventions to *CARs*. Our dependent variables (y) are *CARs*, that is, the abnormal return for the stock price of the single G-SIB in the considered event window. Our independent variables are: a vector (X) of dummy variables indicating an announcement (or not) in each of the j-th macro-category of policy interventions,[6] a dummy variable (*WORLD*) indicating if policy interventions are also announced in another currency area (i.e., in a currency area different from that in which the bank operates), and

6 We consider bank failures and bailouts as a unique category because of the small number of observations (Table II). This is also consistent with the policy event categorization suggested by Ait-Sahalia et al. (2012). We drop the category "Other measures" (OM): even though dummy variables for several event types are not exactly mutually exclusive, the inclusion of this category may generate multicollinearity problems.

MULT, a dummy variable indicating that there is more than one announcement in the same date.[7] As such, we estimate the following model:

$$CAR_i = \alpha + \sum_j \beta_j x_i + \gamma WORLD_i + MULT_i + \varepsilon_i \quad (5)$$

We also run similar models to investigate the impact on the CDS spreads of G-SIBs and the stock market reaction of the selected sample of NFCs. As shown in Table II, the temporal distribution of policy interventions was quite heterogeneous during the investigated period, as a consequence of the diverse stages of the financial crisis; for example, during the global crisis period, several support measures for the financial sector were announced, while during the subsequent sovereign debt crisis period most of these measures were reversed (e.g., several US banks were able to repay back TARP funds). To check for the effect of time, we include quarter dummies. To check for the effect of unobserved variables that remain constant for specific issuers over time, we also include bank (or firm) fixed effects into our model.

4. Results

We discuss our empirical findings mainly focusing on the effect of policy interventions on the banking industry (i.e., on the stock price and the CDS spread of G-SIBs). Our comments are based on the most comprehensive estimates including both firm and time fixed effects.[8] In Section 4.1, we discuss results for our general model in which we estimate the effect on the macro-category level (as defined in Table II) on both G-SIBs and NFCs. This general model implicitly assumes that G-SIBs are very large banks with a high level of internationalization and that there are no strong differences among them. In Section 4.2, we explore the possibility that differences deriving from the currency area in which G-SIBs are located (and hence the stock market in which they are quoted) may influence the effect of policy interventions.

4.1 A General Assessment of Various Types of Policy Intervention

In this section, we discuss the results obtained running a general model in which *CARs* for each G-SIB are regressed on a set of dummy variables that identify several types of intervention at the macro-category level (as defined in Table II). We use the following five different dependent variables to have a broad and robust assessment of the effect of policy interventions: the G-SIB's abnormal stock returns (models 1 and 2), the G-SIB's market-adjusted stock returns (models 3 and 4), the G-SIB's credit spread change (model 5 and 6), the NFC's abnormal stock returns (models 7 and 8), and the NFC's market-adjusted stock returns (models 9 and 10). For each dependent variable, we run the model twice. In models 1,

7 When there is only one announcement in the currency area where the bank operates, both *MULT* and *WORLD* take the value of 0. When there is more than one announcement in the same currency area where the bank operates, *MULT* takes the value of 1 and *WORLD* the value of 0. When there is only one announcement in a currency area different from where the bank operates, *MULT* takes the value of 0 and *WORLD* the value of 1.When there are several announcements, some in the same currency area where the bank operates, and others in the rest of the world, both *MULT* and *WORLD* take the value of 1.

8 Results for the models excluding time and firm fixed effects do not alter the main conclusions and are available from the authors upon request.

3, 5, 7, and 9 we consider dates in which more than one measure is announced; as such, we include a dummy (*MULT*) to account for overlapping events. In the remaining models (i.e., 2, 4, 6, 8, and 10), we limit observations to dates in which only one policy intervention is announced (consequently, we do not need to include *MULT*). These models reduce difficulties in interpreting results due to the elimination of overlapping events; however, the number of remaining policy interventions, and the explanatory power of the model, substantially declines because overlapping interventions have been very frequent during the financial crisis.

First, we focus on monetary policy interventions. Coefficient estimates for both expansionary and restrictive monetary policy actions (*MON_POL_EXP* and *MON_POL_RES*, respectively) are positive in both models 1 and 2 in Table IV. The coefficients are also statistically significant at the 5% and 1% levels, respectively, indicating that investors generally welcome monetary policy interventions for large banks. When we use market-adjusted stock returns as dependent variable (models 3 and 4 in Table IV), results are similar: the investors' reaction appears to be even stronger, resulting in statistical significance (at the 10% level) even in the model without overlapping announcements, at least in the case of expansionary measures. Overall, this is a very interesting result: with reference to G-SIBs, market participants are found to trust monetary policy authorities in times of crisis irrespective of the type of intervention. It is important to underline that we consider both standard interest rate decisions and nonconventional measures. The link between bank stock market prices and interest rates is a complex relationship, even in periods of stability, since interest rates not only influence bank revenues but also impact credit demand, the value of guarantees offered by debtors, and the value of financial instruments held by banks for investment (see, e.g., Yin, Yang, and Handorf, 2010; Yin and Yang, 2013). In addition to this, an increase in interest rates decreases the net present value of a bank's future cash flows. As a result, it is not easy to predict the final impact of changes in interest rates on banks' stock prices. Furthermore, in times of crisis, interest rate decisions are accompanied by nonconventional measures, aiming at supporting funding banks and, hence, at enhancing credit to the private sector (see, e.g., ECB, 2010, 2011). Moving to the impact on G-SIBs' CDS spreads (models 5 and 6 of Table IV), we find that restrictive measures increase the banks' default risk perceived by investors: this is not surprising since an increase in interest rates or a liquidity contraction may aggravate the solvency conditions of banks, and it is likely that results are mainly driven by the CDS spread changes registered for the weakest banks. We do not have conclusive results for expansionary measures. Looking at market model abnormal returns for NFCs (models 7 and 8 of Table IV), we show a negative reaction to both expansionary and restrictive monetary measures, with a higher level of significance in the model considering all observations (similar results are also found with market-adjusted returns; see Table IV, models 9 and 10). As outlined by Kiley (2014), expansionary monetary policy has historically been associated with declines in interest rates, and then, with higher equity prices. Under this traditional view, the negative reaction of NFCs to expansionary announcements is a quite unexpected result; however, there are some recent papers reporting that stock market prices negatively react to expansionary announcements. Kiley (2014) underlines that, after the crisis, the relationship between policy interest rates and equity prices has been complicated by the zero lower bound, leading to a decrease in the effectiveness of monetary policy in stimulating the real economy. Similarly, Woodford (2012) finds evidence of a weakened response of stock prices to policy announcements. Consistently with our results, Doh and Connolly (2013) shows that stock

Table IV. The effect of policy interventions on G-SIBs and NFCs. Base model

This table reports empirical results by running our base model using (i) Cumulated Abnormal Returns calculated for G-SIBs, (ii) Market Adjusted Returns calculated for G-SIBs, (iii) changes in 5-year senior *CDS* spreads for G-SIBs, (iv) CARs for NFCs, and (v) Market Adjusted Returns calculated for NFCs. We consider all policy interventions announced during June 2007–2012 and compute the effect using a 3-day event window (−1,+1). Robust standard errors are in parentheses. *, **, *** denote statistical significance at the 1, 5 and 10% levels, respectively. *MON_POL_EXP* is a dummy variable indicating expansionary measures taken by Central Banks. *MON_POL_RES* is a dummy variable indicating restrictive measures taken by Central Banks. *FIN_SUPPORT* is a dummy variable corresponding to financial sector policies including all instruments used to resolve systemic banking crises. *END_FIN_SUPPORT* is a dummy variable indicating the end of *FIN_SUPPORT* measures. *INACTION* is a dummy variable indicating decisions allowing single banks to fail or bailout. *WORLD* is a dummy variable equal to one if there is an intervention announced in the rest of the world (i.e., in a different currency area). *MULT* is a dummy variable equal to one if more than one measure is announced in the same date. CONS is the intercept of the model. Models (2), (4), (6), (8) and (10) are run limiting the sample to observations for which the dummy *MULT* is equal to zero (i.e., only one measure is announced in the same date).

	G-SIBs		G-SIBs		G-SIBs		NFCs		NFCs	
Variables	(1) $Y=CAR$	(2) $Y=CAR$	(3) $Y=MAR$	(4) $Y=MAR$	(5) $Y=\Delta CDS$	(6) $Y=\Delta CDS$	(7) $Y=CAR$	(8) $Y=CAR$	(9) $Y=MAR$	(10) $Y=MAR$
MON_POL_EXP	0.03732**	0.01613	0.05185***	0.02070*	−0.08099***	0.01967*	−0.08646***	−0.03595*	−0.09676***	−0.01600
	(0.01567)	(0.01333)	(0.01396)	(0.01201)	(0.01168)	(0.00986)	(0.02016)	(0.02083)	(0.01787)	(0.02115)
MON_POL_RES	0.08212***	0.01502	0.07975***	0.01250	0.01069*	0.11524***	−0.07846***	−0.03393*	−0.08208***	−0.03219*
	(0.01175)	(0.01083)	(0.01179)	(0.01115)	(0.00576)	(0.01250)	(0.01851)	(0.01881)	(0.01686)	(0.01730)
FIN_SUPPORT	0.04345**	0.01125	0.04615***	0.03315*	−0.04893***	−0.00999	−0.07020***	−0.03687**	−0.06342***	−0.03397**
	(0.01872)	(0.02019)	(0.01632)	(0.01782)	(0.00882)	(0.00864)	(0.01739)	(0.01739)	(0.01637)	(0.01603)
END_FIN_SUPPORT	0.00896	−0.03055*	0.01761	−0.00481	0.06851***	0.17124***	−0.05373***	−0.06488***	−0.04608***	−0.06225***
	(0.01622)	(0.01739)	(0.01609)	(0.01788)	(0.00918)	(0.02069)	(0.01587)	(0.01835)	(0.01508)	(0.01735)

(continued)

Table IV. Continued

	G-SIBs		G-SIBs		G-SIBs		NFCs		NFCs	
Variables	(1) $Y = CAR$	(2) $Y = CAR$	(3) $Y = MAR$	(4) $Y = MAR$	(5) $Y = \Delta CDS$	(6) $Y = \Delta CDS$	(7) $Y = CAR$	(8) $Y = CAR$	(9) $Y = MAR$	(10) $Y = MAR$
INACTION	−0.09883***	−0.20293***	−0.09062**	−0.22817***	0.10669***	0.33990***	0.01052	−0.08900***	0.01435	−0.06089*
	(0.03456)	(0.04042)	(0.03323)	(0.04045)	(0.02158)	(0.03932)	(0.02306)	(0.03233)	(0.02261)	(0.03218)
WORLD	0.03068	0.02885	0.03962**	0.03378*	−0.02975**	−0.01814	−0.02660*	−0.03679**	−0.01489	−0.02825**
	(0.01873)	(0.01977)	(0.01506)	(0.01746)	(0.01421)	(0.01382)	(0.01493)	(0.01339)	(0.01538)	(0.01313)
MULT	−0.09733***	–	−0.08179***	–	−0.00527	–	0.08780***	–	0.06474***	–
	(0.01210)	–	(0.01088)	–	(0.00780)	–	(0.02000)	–	(0.01990)	–
CONS	−0.09182**	−0.11269***	−0.12171***	−0.04361*	0.25961***	0.11423***	0.10978**	0.15226*	0.21215***	0.04929
	(0.04112)	(0.02576)	(0.04352)	(0.02233)	(0.02837)	(0.03101)	(0.04743)	(0.07517)	(0.05929)	(0.06978)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,359	12,860	20,359	12,860	18,051	11,356	21,049	16,306	21,049	16,306
R^2	0.01264	0.01983	0.01798	0.02168	0.03485	0.04627	0.00951	0.00744	0.01472	0.01335

prices have often declined after the Federal Reserve has indicated a more accommodative future policy path. According to the authors, financial markets may perceive the announcement of a more accommodative monetary policy as coming from a worsening in the economic outlook that depressed stock prices. All these papers are based on the US experience; however, the same mechanisms (e.g., the effect of the zero lower bound and the association between monetary policy announcements and economic outlook), may be easily extended to other currency areas, and then to our analysis, contributing to explain the negative reaction registered by NFCs in our analysis.

Second, we analyze the effect of other policy interventions aimed at supporting the banking system. Looking at the market model abnormal returns for G-SIBs (Table IV, models 1 and 2), the announcement of recovery measures (*FIN_SUPPORT*) shows a positive coefficient in both models and the one estimated in model 1 is also significant at the 5% level. In contrast, the end of these measures (*END_FIN_SUPPORT*) displays a negative coefficient, statistically significant at the 10% level in model 2. In terms of sign of the coefficients, the results are substantially the same when using market-adjusted abnormal returns (models 3 and 4 in Table IV). Consistently, the impact on CDS spreads shows a reduction in risk for the announcement of *FIN_SUPPORT* (significant at 1% in model 5 in Table IV) and an increase in risk for *END_FIN_SUPPORT* (significant at 1% in both models 5 and 6). Moving to the reaction for NFCs (Table IV, models 7, 8, 9 and 10), we observe a negative response for both the introduction and the end of measures to support banks (with a high level of statistical significance for both market model abnormal returns and market-adjusted returns).

Finally, we move onto cases in which public authorities prefer not to intervene. With reference to G-SIBs, we find that policy decisions allowing a single bank to fail or bailout[9] (*INACTION*) have a negative coefficient, significant at 1% in both models 1 and 2 in the Table IV (also confirmed when using market-adjusted returns, models 3 and 4). Consistently, the impact in terms of CDS spreads show an increase in the bank default risk perceived by investors, significant at 1% in both models 5 and 6. In this case, the effect for NFCs is similar to the one for G-SIBs: when significant, the reaction is negative, considering both abnormal returns (models 7 and 8 in Table IV) or simple market-adjusted returns (models 9 and 10 in Table IV).

Overall, considering all types of interventions in response to the financial crisis, and both monetary policy and recovery measures for the banking industry, we can observe a quite positive market reaction for large banks, and a negative one for large NFCs. Overall, the general model provides some evidence in favor of our main hypothesis, that is, policymakers' interventions generate a positive market reaction by investors and, hence, policymakers' inaction produces an adverse reaction. Our findings are conclusive for the banking sector (i.e., when we consider both stock price and CDS spread reactions for G-SIBs), while they are less consistent for NFCs. In this case, the reaction is always negative for both announcements introducing and retiring support measures. This suggests that investors in NFCs do not completely trust monetary authorities and governments. On the one hand, they probably believe announced monetary and recovery measures are able to support banks but unable to restore the real economy. On the other hand, there are some signals

9 Bailouts are cases in which policymakers were not able to prevent a crisis, but intervened in a fully developed crisis, to guarantee an orderly resolution. Literally it is not inaction, but a 'late action'.

that these investors agree on the importance of impeding banks' failures, as indicated by their negative reaction to *END_FIN_SUPPORT* and *INACTION*.

This basic model implicitly assumes that G-SIBs are huge banks with a high level of internationalization, and that there are no strong differences among them, due to the geographic area where they operate, or the stock market in which they are quoted. However, we cannot take this strong assumption for granted and we have to test it using alternative models that are presented in the next section.

4.2 The Role of Differences in Currency Areas

In this section, we explore the possibility of differences deriving from the currency area in which G-SIBs are located, and hence the stock market in which they are quoted.

In the first step, we discuss results for a model in which all G-SIBs are considered together,[10] and there are no policy interventions announced in currency areas different from the one in which the bank operates (i.e., the dummy variable *WORLD* takes the value of zero). The variable *MULT* is still included in the model, since it is possible to have several announcements in the same currency area on the same date.

As shown in Table V, the explanatory power is much larger than for the base model, perhaps signaling some differences due to the operation and listing in different currency areas. Consistent with the general model in Table IV, we observe that both expansionary and restrictive monetary policy decisions generally show positive coefficient estimates in models 1–4, showing a favorable reaction among investors. The only exception is model 1 (using market model ARs as a dependent variable): the coefficient estimate for monetary expansionary measures in model 1 is negative and significant at 10%. The announcement of financial support measures (*FIN_SUPPORT*) is not found to produce any statistically significant reaction in model 1, while the coefficient is negative and significant at 5% when we consider model 2 (similar results are obtained using market-adjusted returns, see models 3 and 4). This suggests that, at the domestic level, the introduction of support measures is interpreted by investors as a signal of weakness of local banks; this is consistent with the increase in CDS spreads shown in both models 5 and 6 (significant at 1%). We also find that the end of these support measures (*END_FIN_SUPPORT*) generates a positive market reaction: as such, investors seems to interpret the end of these support measures as a signal of recovery and renewed stability in the financial services industry, but this contrasts with the contemporaneous increase in CDS spreads. For failures and bailouts (*INACTION*), findings are very consistent with the general model shown in Table IV, showing a reduction in value and an increase in risk.

Overall, the major differences with respect to the general model emerge for measures aiming at restore the financial services industry. To better explore these differences, we run separate models for two main currency areas (EUR and USA) of interest.

As shown in Table VI, expansionary monetary policy decisions are able to decrease the perceived banks' default risk in the EUR (i.e., the coefficient for CDS spreads is negative and significant at 1%), while an opposite effect is found for the USA (i.e., the coefficient is positive and significant at 1%). Enhancing liquidity conditions may be interpreted as a signal of weakness for local banks in the USA; this view is supported by the positive stock price reaction registered by US G-SIBs with reference to restrictive measures.

10 In this case, the Bank of China and Nordea are excluded from the sample, since we did not collect policy interventions for these currency areas.

Table V. The effect of policy interventions on G-SIBs

Alternative model for domestic interventions

This table reports empirical results by running our base model using (i) Cumulated Abnormal Returns calculated for G-SIBs, (ii) Market Adjusted Returns calculated for G-SIBs, and (iii) changes in 5-year senior CDS spreads for G-SIBs. We consider all policy interventions announced during June 2007–2012 and compute the effect using a 3-day event window (−1,+1). We limit the sample to observations for which the dummy variable *WORLD* is equal to zero (i.e., there are no interventions announced in currency areas different from that where the bank operates). Robust standard errors are in parentheses.*, **, *** denote statistical significance at the 1, 5 and 10% levels, respectively. *MON_POL_EXP* is a dummy variable indicating expansionary measures taken by Central Banks. *MON_POL_RES* is a dummy variable indicating restrictive measures taken by Central Banks. *FIN_SUPPORT* is a dummy variable corresponding to financial sector policies including all instruments used to resolve systemic banking crises. *END_FIN_SUPPORT* is a dummy variable indicating the end of *FIN_SUPPORT* measures. *INACTION* is a dummy variable indicating decisions allowing single banks to fail or bailout. *MULT* is a dummy variable equal to one if more than one measure is announced in the same date. CONS is the intercept of the model.

Variables	(1) $Y = CAR$	(2) $Y = CAR$	(3) $Y = MAR$	(4) $Y = MAR$	(5) $Y = \Delta CDS$	(6) $Y = \Delta CDS$
MON_POL_EXP	−0.06923*	0.02273	0.01428	−0.00271	−0.01288	0.07561
	(0.03787)	(0.03439)	(0.03935)	(0.03621)	(0.03219)	(0.04624)
MON_POL_RES	0.07553**	0.12632***	0.08280***	0.11021***	0.04694*	0.11657***
	(0.03170)	(0.03777)	(0.02918)	(0.03710)	−0.02606	(0.02698)
FIN_SUPPORT	0.04040	−0.07836**	0.01630	−0.09060***	0.10027***	0.15234***
	(0.03318)	(0.03512)	(0.02954)	(0.02918)	(0.02184)	(0.02010)
END_FIN_SUPPORT	0.14118***	0.17447***	0.14607***	0.17736***	0.07079**	0.13166***
	(0.02846)	(0.03100)	(0.02672)	(0.02967)	−0.03229	(0.03643)
INACTION	−0.47885***	−0.23963***	−0.49812***	−0.32362***	0.42381***	0.47988***
	(0.06704)	(0.06436)	(0.06454)	(0.05960)	(0.07191)	(0.07001)
MULT	−0.04450	–	−0.04744	–	−0.03501	–
	(0.04164)	–	(0.03867)	–	(0.03857)	–
CONS	−0.34060***	−0.39592***	−0.23391*	−0.22863*	0.01101	0.10081*
	(0.11816)	(0.12267)	(0.11724)	(0.11739)	(0.03318)	(0.05643)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,213	2,695	3,213	2,695	2,703	2,276
R^2	0.06036	0.06230	0.06326	0.06639	0.07125	0.05853

We now focus our attention on financial support measures by: (i) considering dates in which there is only one announcement ($MULT = 0$); and (ii) including a more granular classification of financial support measures. Specifically, we distinguish our empirical findings, focusing on three kinds of interventions: (a) recovery measures for banks in the form of asset purchase or ring-fencing of bad assets and asset guarantees (*FIN_ASSET*); (b) recovery measures for banks in the form of guarantees for old or new liabilities, enhancement of depositor protection schemes, and provision of lender of last resort facilities (*FIN_LIABL*); and (c) capital injections and nationalization, that is, acquisition of a controlling share (*FIN_RECAP*).

Recovery measures in the form of asset purchase or ring-fencing of bad assets and asset guarantees (*FIN_ASSET*) exhibit a positive link with *CARs* for G-SIBs operating in the

Table VI. The effect of the Financial support measures on G-SIBs—EUR versus USA

This table reports empirical results by running our base model using (i) Cumulated Abnormal Returns calculated for G-SIBs, (ii) Market Adjusted Returns calculated for G-SIBs, and (iii) changes in 5-year senior *CDS* spreads for G-SIBs, separately for the EUR and the USA. We consider all policy interventions announced during June 2007–2012 and the compute the effect using a 3-day event window (−1,+1). We limit the sample to observations for which the dummy variable *WORLD* is equal to zero (i.e., there are no interventions announced in currency area different from that where the bank operates). Robust standard errors are in parentheses. *, **, *** denote statistical significance at the 1, 5 and 10% levels, respectively. *MON_POL_EXP* is a dummy variable indicating expansionary measures taken by Central Banks. *MONPOLRES* is a dummy variable indicating restrictive measures taken by Central Banks. *FIN_ASSET* includes recovery measures for banks in form of asset purchase or ring-fencing of bad assets and asset guarantees; *FIN_LIABL* includes recovery measures for banks in form of guarantees for old or new liabilities, enhancement of depositor protection schemes, and provision of lender of last resort facilities; *FIN_RECAP* includes capital injections and nationalization (acquisition of controlling share). *END_FIN_SUPPORT* is a dummy variable indicating the end of *FIN_SUPPORT* measures. *INACTION* is a dummy variable indicating decisions allowing single banks to fail or bailout. *CONTROL* is a dummy variable equal to one if more than one measure is announced in the same date. CONS is the intercept of the model.

	EUR			USA		
Variables	(1) $Y = CAR$	(2) $Y = MAR$	(3) $Y = \Delta CDS$	(4) $Y = CAR$	(5) $Y = MAR$	(6) $Y = \Delta CDS$
MON_POL_EXP	0.05612	0.07345	−0.14449***	0.02350	−0.01977	0.12048***
	(0.08343)	(0.08490)	(0.03591)	(0.04881)	(0.05010)	(0.02772)
MON_POL_RES	−0.00007	−0.03600	−0.01299	0.29339***	0.31181***	0.01787
	(0.10538)	(0.08893)	(0.02288)	(0.04707)	(0.04751)	(0.02506)
FIN_ASSET	0.41003***	0.27582**	0.02623	−0.25496	−0.33480**	−0.06189
	(0.11665)	(0.10277)	(0.06279)	(0.14457)	(0.11851)	(0.10665)
FIN_LIABL	−0.00461	−0.08115*	0.06654**	−0.02775	−0.02963	0.14286**
	(0.04777)	(0.04096)	(0.02247)	(0.24521)	(0.23524)	(0.04893)
FIN_RECAP	−0.29498**	−0.32598**	0.26346***	−0.02422	0.05540	0.18017**
	(0.11319)	(0.10586)	(0.02561)	(0.08112)	(0.06367)	(0.05834)
END_FIN_SUPPORT	0.37211*	0.58363**	0.17616***	0.28699***	0.29835***	0.11518***
	(0.19296)	(0.19957)	(0.04532)	(0.07188)	(0.06797)	(0.02419)
INACTION	−0.14693*	−0.32392***	0.35953***	−0.30937**	−0.29326**	0.52990**
	(0.07204)	(0.06790)	(0.06178)	(0.09815)	(0.08578)	(0.15951)
CONSTANT	1.10858***	1.23048***	0.35953***	−0.33830***	−0.28076***	0.52990**
	(0.22879)	(0.22097)	(0.06178)	(0.04054)	(0.03558)	(0.15951)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	911	911	1,070	1,384	1,384	1,272
R^2	0.12320	0.11942	0.06223	0.10839	0.15214	0.18689

EUR, which are significant at the 1% level when using market model abnormal returns (model 1) and at the 5% level when using market-adjusted returns (model 2)—with no significant effects on CDS spreads (model 3). In the USA, we do not find statistically significant relationships between *FIN_ASSET* and market model abnormal returns (model 4), or CDS spreads (model 6). However, when using market-adjusted returns (model 5), the coefficient is negative and significant at the 5% level. Recovery measures in the form of

guarantees for old or new liabilities, enhancement of depositor protection schemes, and provision of lender of last resort facilities (*FIN_LIABL*), generally do not display a statistically significant relationship with stock price of G-SIBs, both in the EUR and USA (the only exception is a negative coefficient, significant at 10% in model 2); and the effect on CDS spreads is an increase in the default risk perceived by investors in both currency areas. Finally, capital injections and nationalization (*FIN_RECAP*) generally exhibit a negative link with stock prices, for both EUR and USA (significant at 5% only for the EUR, using both market model and market-adjusted returns), with an increase in CDS spreads in both currency areas.

European investors seem to have a more positive sentiment than US investors with respect to public measures aimed at supporting the financial industry. This may be due to several reasons, including the primary role of banks in the European financial services industry, the fact that the global financial crisis originated in the USA (US banks may be identified as responsible), and also to cultural differences generating a diverse perception of the role of governments and markets. However, recapitalization measures seem to be not welcomed by investors of the Euro zone. As already outlined in Panetta et al. (2009), results may be explained by concerns about the dilution of shareholders' rights, public intervention in the bank management, and uncertainty about the duration of the plan.

Overall, it is possible to conclude that European investors are favorable to emergency public interventions to save local banks, but, at the same time, are scared by the possibility of a relevant and stable public inference in bank management.

5. Conclusions

During the crisis period, financial markets gave great attention to any actions (including nonconventional ones) taken by policymakers to reduce risk and uncertainty in financial markets. Indeed, policymakers throughout the world have run a wide set of policy interventions using new instruments and techniques to restore the stability of banking systems. What type of policy interventions achieved the best results? Our article answers this question by analyzing the effect of a wide set of policymakers' interventions (specifically, 1,322 policy interventions worldwide, between June 1, 2007 and June 30, 2012) on the stock price and the CDS spreads of G-SIBs. As a robustness check, we also estimated the effect of policy intervention on a control sample of 31 large NFCs.

We ran an event study to estimate stock market reactions around the announcement day as a proxy for the success of each action. To strengthen our results, we calculated ARs using both the market model and the market-adjusted approach, so that our conclusions are robust to possible model misspecification, contamination in the estimation window, and nonstationarity of risk parameters.

Overall, the general model provides some evidence in favor of our main hypothesis, that is, policymakers' interventions generate a positive market reaction by investors and, hence, policymakers' inaction produces an adverse reaction. Findings appear conclusive for the banking sector when considering the stock price of G-SIBs, especially for monetary policy interventions, that are generally welcomed by investors irrespective of their expansionary or restrictive direction. For NFCs, results are less favorable to our hypothesis. In this case, the reaction is always negative for both announcements introducing and retiring support measures. This is a signal that investors in NFCs do not completely believe in the ability of monetary authorities and governments to restore the real economy or perceive

accommodative and support measures as a signal of a negative economic outlook. Nevertheless, these investors agree on the importance of impeding banks' failures, as indicated by their negative reaction to the end of support measures, bank failures, and bailouts.

Other interesting results concern the nature of G-SIBs. Despite their systemic relevance, G-SIBs are not found to be equally responsive to global interventions; they are more sensitive to policy interventions announced in their own currency areas. Furthermore, some types of interventions are perceived in a different way depending on the geographic area where the bank operates. A vivid example is given by financial support measures that generate diverse reactions in the EUR and in the USA. With respect to the USA, in Europe there is a more positive sentiment about public measures to support the financial industry, but some kinds of measures are negatively perceived in both areas. Overall, our article finds that, despite their global nature, G-SIBs are quite different from one another and show stronger reaction to domestic policy interventions.

We acknowledge some limitations of our analysis due to the adoption of the event study approach and to the problem of overlapping events. However, the adopted methodology is the only way to investigate investors' reactions and expectations in a period in which interventions have been implemented at a frenetic pace. Overall, we believe that this study provides important evidence on the effect of monetary and government interventions in response to the global financial crisis, showing that, even though the crisis and the largest world banks are generally considered to be global, there is no unique recipe for restoring the banks. Quite the opposite: there is very strong heterogeneity across institutions of different systemic relevance and location, and between investors interested in the financial services industry or in other sectors of the "real economy".

References

Afonso, A., Furceri, D., and Gomes, P. (2012) Sovereign credit ratings and financial markets linkages: Application to European data, *Journal of International Money and Finance* **31**, 606–638.

Aït-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S., and Tamirisa, N. (2010) Market response to policy initiatives during the global financial crisis. Working paper 15809, National Bureau of Economic Research.

Aït-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S., and Tamirisa, N. (2012) Market response to policy initiatives during the global financial crisis, *Journal of International Economics* **87**, 162–177.

Baba, N. and Packer, F. (2009) From turmoil to crisis: dislocations in the FX swap market before and after the failure of Lehman Brothers. Working Paper 285, Bank for International Settlements.

Bernanke, B., Reinhart, V. R., and Sack, B. (2004) Monetary policy alternatives at the zero bound: an empirical assessment, *Brookings Papers on Economic Activity* **2**, 1–78.

Bernanke, B. S. and Kuttner, K. N. (2005) What explains the stock market's reaction to Federal Reserve policy?, *Journal of Finance* **60**, 1221–1257.

Bomfin, A. N. (2003) Pre-announcement effects, news effects, and volatility: monetary policy and the stock market, *Journal of Banking and Finance* **27**, 133–151.

Borio, C. and Zhu, H. (2012) Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?, *Journal of Financial Stability* **8**, 236–251.

Bredin, D., Hyde, S., and Reilly, G. O. (2010) Monetary policy surprises and international bond markets, *Journal of International Money and Finance* **29**, 988–1002.

Chulià, H., Martens, M., and van Dijk, D. (2010) Asymmetric effects of federal funds target rate changes on S&P100 stock returns, volatilities and correlations, *Journal of Banking and Finance* **34**, 834–839.

Doh, T. and Connolly, M. (2013) Has the effect of monetary policy announcements on asset prices changed? Federal Reserve Bank of Kansas City, *Economic Review*, Third Quarter 2013.

Dell'Ariccia, G., Laeven, L., and Suarez, G. (2013) Bank leverage and monetary policy's risk-taking channel. Evidence from the United States, IMF Working Papers 13/143, International Monetary Fund, U.S.

Draper, P. and Paudyal, K. (2008) Information asymmetry and bidders' gains', *Journal of Business, Finance and Accounting* **35**, 376–405.

Ehrmann, M. and Fratzscher, M. (2004) Monetary policy transmission to equity markets, *Journal of Money, Credit and Banking* **36**, 719–737.

European Central Bank (2010) The ECB's response to the financial crisis, *Monthly Bulletin*, October 2010, 59–74.

European Central Bank (2011) The ECB's non-standard measures—impact and phasing-out, *Monthly Bulletin*, July 2011, 55–69.

Fiordelisi, F., Galloppo, G., and Ricci, O. (2014) The effect of monetary policy interventions on interbank markets, equity indices and G-SIFIs during financial crisis, *Journal of Financial Stability* **11**, 49–61.

Fuller, K., Netter, J., and Stegemoller, M. (2002) What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions, *Journal of Finance* **57**, 1763–1793.

Gagnon, J., Raskin, M., Remache, J., and Sack, B. (2011) The financial market effects of the Federal Reserve's large-scale asset purchases, *International Journal of Central Banking* **7**, 45–52.

Gertler, M. and Karadi, P. (2013) QE 1 vs. 2 vs. 3: a framework for analyzing large-scale asset purchases as a monetary policy tool, *International Journal of Central Banking* **9**, 5–53.

Gertler, M. and Karadi, P. (2015) Monetary policy surprises, credit costs, and economic activity, *American Economic Journal: Macroeconomics* **7**, 44–76.

Gregory, A. and O' Donohoe, S. (2014). Do cross border and domestic acquisitions differ? Evidence from the acquisition of UK targets, *International Review of Financial Analysis* **31**, 61–69.

Hanson, S. and Stein, J. (2015). Monetary policy and long-term real rates, *Journal of Financial Economics* **115**, 429–448.

Hausman, J. and Wongswan, J. (2011) Global asset prices and FOMC announcements, *Journal of International Money and Finance* **30**, 547–571.

Ismailescu, I. and Hossein, K. (2010) The reaction of emerging market credit default swap spreads to sovereign credit rating changes, *Journal of Banking and Finance* **34**, 2861–2873.

Jawadi, F., Arouri, M. D., and Nguyen, D. J. (2010) Global financial crisis, liquidity pressure in stock markets and efficiency of central bank interventions, *Applied Financial Economics* **20**, 669–680.

Kiley, M. T. (2014) The response of equity prices to movements in long-term interest rates associated with monetary policy statements: before and after the zero lower bound, *Journal of Money, Credit and Banking* **46**, 1057–1071.

Kothari, S. P. and Warner J. B. (2006). Econometrics of event studies, in: B. E. Eckbo (ed.), *Handbook of Corporate Finance: Empirical Corporate Finance*, North Holland, Amsterdam, pp. 3–32.

Kutan, A. M., Muradoglu, G., and Sudjana, B. G. (2012) IMF programs, financial and real sector performance, and the Asian crisis, *Journal of Banking and Finance* **36**, 164–182.

Leòn, Á. and Sebestyén, S. (2012) New measures of monetary policy surprises and jumps in interest rates, *Journal of Banking and Finance* **36**, 2323–2343.

MacKinlay, A. C. (1997) Event studies in economics and finance, *Journal of Economic Literature* **35**, 13–39.

Madsen, P. M. and Zachariah J. R. (2015) Looking good by doing good: the antecedents and consequences of stakeholder attention to corporate disaster relief, *Strategic Management Journal* **36**, 776–794.

McAndrews, J., Sarkar, A. and Wang, Z. (2008) The effect of the term auction facility on the London Inter-Bank offered rate. Federal Reserve Bank of New York Staff Report No. 335.

Meaning, J. and Zhu, F. (2011) The impact of recent central bank asset purchase programmes, *BIS Quarterly Review*, December 2011, 73–83.

Mishkin, F. S. (2010) Over the cliff: from the subprime to the global financial crisis. Working paper 16609, National Bureau of Economic Research.

Panetta, F., Faeh, T., Grande, G., Ho, C., King, M., Levy, A., Signoretti, F., Taboga, M., and Zaghini, A. (2009). An assessment of financial sector rescue programmes. Occasional Paper No. 47, Bank of Italy.

Pennathur, A., Smith, D., and Subrahmanyam, V. (2014) The stock market impact of government interventions on financial services industry groups: evidence from the 2007-2009 crisis, *Journal of Economics and Business* **71**, 22–44.

Rangel, J. G. (2011) Macroeconomic news, announcements, and stock market jump intensity dynamics, *Journal of Banking and Finance* **35**, 1263–1276.

Rosa, C. (2011) Words that shake traders. The stock market's reaction to central bank communication in real time, *Journal of Empirical Finance* **18**, 915–934.

Swanson, E. T., Reichlin, L., and Wright, J. H. (2011) Let's twist again: a high-frequency event-study analysis of operation twist and its implications for QE2, *Brookings Papers on Economic Activity* **1**, 151–207.

Woodford, M. (2012) Methods of policy accommodation at the interest-rate lower bound, prepared for 2012 Jackson Hole Symposium sponsored by the Federal Reserve Bank of Kansas City.

Yin, H. and Yang, J. (2013) Bank characteristics and stock reactions to federal funds rate target changes, *Applied Financial Economics* **23**, 1755–1764.

Yin, H., Yang, J., and Handorf, W. C. (2010) State dependency of bank stock reaction to federal funds rate target changes, *The Journal of Financial Research* **33**, 289–315.