AIG'S ANNOUNCEMENTS, FED'S INNOVATION, CONTAGION AND SYSTEMIC RISK IN THE FINANCIAL INDUSTRY

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ABSTRACT:

This paper aims at testing the effect of AIG's loss announcements and Federal Reserve's subsequent innovation on the financial industry. An analysis of seemingly unrelated regression on the returns of four industries- banking, insurance, brokerage firms and savings and loan Institutions (S&Ls) for the period September 5, 2007 to December 31, 2008 reveals that, the Federal Reserve's announcement on September 16, 2008 and October 8, 2008 to pledge $85 billion and $37.8 billion, respectively has the most impact on the financial sector. All the four industries are also sensitive towards any shock in the short run, long run interest rate and the market return. The market experiences significant contagion and incremental systemic risk after the bailout by the Federal Reserve but we do not find any significant evidence in support of the Federal Reserve's perception of AIG to be too-big-to-fail.

JEL classification: G21; G29.

Keywords: AIG; Financial Crisis; Bailout; Too-big-to-fail; Contagion; Systemic Risk.

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1. Introduction

In this paper we analyze the near collapse of the American International Group, Inc. (AIG), the corresponding innovation by the Federal Reserve Bank of New York in the year 2008, and its consequences in the financial industry. The recent recession in 2007-2008 is the second largest financial crises the history of the U.S. economy. This crisis is mainly initiated by the serious subprime mortgage crisis in June 20, 2007 when two Bear Stearns managed hedge funds nearly collapsed due to the fall in the value of the collateralized debt obligations (CDOs). A number of financial institutions follow Bear Stearns in a row; e.g., Lehman brothers files for Chapter 11 bankruptcy protection on September 15, 2008 and at the same time AIG suffers a huge liquidity crisis due to unrealized losses from its credit default swap (CDS) portfolio. Federal Reserve, in September 16, 2008, announced bailout in order to help AIG to meet its obligations and save the economy from further fragility and disruption.

AIG operates with a large number of insurance and related products in more than 130 countries. With a total asset of $1.06 trillion in 2007 (AIG Annual Report, 2007), AIG was not expected to suffer severely in the financial crisis. Due to the downgrade in its credit rating, AIG was required to place more collateral for its CDSs. For this AIG faces serious liquidity crisis. The federal government perceives AIG as too-big-to-fail and is not ready to have AIG failed in order to save the economy from further deterioration. In September 16, 2008, the Federal Reserve injects $85 billion to save AIG.

The series of failure or near failure of several financial institutions in 2007 and 2008 provides us with the opportunity to analyze their impact on the market. Investors react to specific events in the economy and it is important to analyze how they perceive and react to the announcement of such events. In an efficient market with informed investors, the market response indicates the likely outcomes or consequences of the events. Analyzing the announcements of such events related to the near failure of AIG reveals how the market reacts to such announcements. Also it is important to analyze how the market responds to the Federal Reserve's innovation to save AIG as it is perceived to be too-big-to-fail.

This paper aims at analyzing the effects of the crisis caused by the near failure of AIG and subsequent innovation by the Federal Reserve on related financial industry. The near failure of AIG initially created a panic in the financial sector and such fear had a contagion effect in the market resulting in the failure or near failure of related financial institutions. We analyze such impact of AIG's near failure, Federal Reserve's innovation, corresponding contagion effect and related effect on systemic risk on four financial industries - banking, insurance, brokerage firms and Savings and Loan Institutions (S&Ls). The results indicate that the long run interest rate has some impact on the returns of the four industries. An event study of five different events indicates that, the market reacted most on two event dates – September 16, 2008; when the Federal Reserve announces to bailout AIG by pledging $85 billion and October 8, 2008; when the Federal Reserve announces to pledge additional $37.8 billion to AIG. All the four industries are also sensitive towards any shock in the short run, long run interest rate and the market return. The market experiences significant contagion and incremental systemic risk during the post-

bailout period but we do not find any significant evidence in support of the Federal Reserve's perception of AIG to be too-big-to-fail.

The next section presents the related literature; section 3 discusses the five most important event dates regarding AIG's announcements and Federal Reserve's innovation. Section 4 discusses the methodology used in this paper and the related data sources. Section 5 discusses the development of relevant hypotheses, section 6 presents the results and section 7 concludes the paper.

2. Literature

Several papers analyze various issues of the recent crisis. Nippani and Smith (2010) test the effect of default risk on the yield of Treasury securities for the period December 2007 to March 2009. They analyze twenty events using OLS method and find that the lower spread (between the 10-year swap and the 10-year US Treasury security) is coherent with a higher default risk of US Treasury securities. Bonfim (2009), using probit model, analyzes the relation between macroeconomic developments and credit risk for the period 1990 to 2004. She identifies some tendency of excessive risk-taking in the periods of economic growth that are accompanied by strong credit growth. Chen (2009) analyzes various macroeconomic variables, by using quarterly data, in order to predict recessions in the stock market for the period 1957 to 2007. By using both parametric (Markov-switching models) and nonparametric methods (Candelon et al., 2008), he concludes that yield curve spreads and inflation rates seem to be the most useful predictors of the US stock market recessions. Kabir and Hassan (2005) examine the contagion and too-big-to-fail hypothesis for long-term capital management (LTCM) crisis for the period June 1996 to October 1998. Using seemingly unrelated regression method they find evidence in favor of the too-big-to-

fail hypothesis. Mamun, Hassan and Johnson (2010) follows a similar method for the Bear Stearns crisis for the period January 2006 to December 2008 and finds that the innovation by the Federal Reserve is perceived positively by the market.

The cost of financial institution failure is larger than that of a non-financial institution failure (James, 1991). Failure of one financial institution spread out a contagion effect; leading to the failure of or extensive losses in similar institutions (Lang and Stulz, 1992). After the near failure of AIG, several other financial institutions, e.g., Lehman Brothers and Citigroup also faced severe financial problem. For this, it is important to analyze the contagion effect of AIG's near failure in the market.

Due to the contagion effect, the failure of AIG may cause a systemic risk leading to a 'domino effect' on other related institutions in the market. Such systemic risk has a consequence beyond the risk of one institution and thus causes a spillover effect in the market. For this it is also important to test for the systemic risk caused by the near failure of AIG. Freixas, Parigi and Rochet (2000) model systemic risk in an interbank setup and also examine the justification for too-big-to-fail policy. They show that liquidation of one bank with key position may cause a systemic risk by triggering liquidation of other bank in the market. Brimmer's (1989) suggests that the Federal Reserve should intervene when there remains a vital risk to disrupt the economy. Hasman and Samartin (2008) also develop a model of contagion based on costly voluntary acquisition of information and conclude that central bank should take a role of completer in the market. The innovation of the Federal Reserve to save AIG is consistent with these conclusions.

3. Event selection[2]

We use five important events in this paper that may have created huge impact in the market. In an SEC filing AIG disclosed the unrealized loss of $1.05 billion to $1.15 billion to its swaps portfolio on December 5, 2007. This made the total unrealized loss of $1.5 billion in 2007 and was of the highest amount so far. Even though CEO Martin Sullivan claimed that the chances of any 'economic loss' in CDS portfolio was 'close to Zero', but federal investigators decided to investigate whether CEO Martin Sullivan and other executives were misleading the investors. This made a huge negative impact on AIG's share price.

On February 28, 2008 AIG reported the largest quarterly loss in its history as it wrote down CDS of $11.1 billion. AIG, for the first time, declared realized loss from its CDSs and stopped its buyback program for the commitments made before the prior year. Joe Cassano, the chief of AIG's financial products unit, resigned on the same date and this became a shock to the investors as they started panicking. But AIG did hide the fact that Joe Cassano was still kept in the company as a consultant and was paid million dollars every month as a consultant (Kiel, 2008).

On August 6, 2008, AIG raised its unrealized loss from CDSs to $14.7 billion that made the total loss $26.2 billion. Also it posted a total of $16.5 billion in collateral. This investors' reaction was severe and the stock price was the lowest in the history of the firm.

Standard & Poor's cut AIG's credit rating on September 15, 2008 and for this AIG needed to raise additional $14.5 billion in collateral. The firm faced collapse. The Federal Reserve felt it needed to save AIG as its failure would deter the financial crisis with a higher magnitude. For

[2] This section has been summarized from different news published at the Wall Street Journal.

this the Federal Reserve, on September 16, 2007, decided to pump $85 billion to help AIG in mitigating its liabilities. As part of the deal, the Federal Reserve gets a 79.9 percent equity interest in AIG. This eased off the tension in the market even though investors could not be sure about the future of the company as well as of the market situation. On October 8, 2008, the Federal Reserve Board decided to pledge an additional $37.8 billion to help AIG face the crisis.

We select the five above mentioned events in order to examine the impact of the announcements of these events in the market, especially in the financial sector. Table 1 presents the selected event dates with corresponding events.

4. Methodology and data

We use returns of four industries - banking, insurance, brokerage firms and savings and loan institutions (S&Ls) to test the effect of AIG's and Federal Reserve's announcements on the market. We use a multivariate regression model (MVRM) following Cornett and Tehranian (1990). Kabir and Hassan (2005) and Mamun, Hassan and Johnson (2010) also follows similar model to analyze the effect of the near collapse of LTCM and Bear Stearns, respectively on the financial institutions and the effect of the corresponding intervention by the Federal Reserve. Equation (1) presents the model –

$$R_{it} = \alpha_i + \beta_{it} Rm_t + \delta_{it} Rlr_t + \theta_{it} Rsr_t + \mu_{it} Rex_t + \sum_{k=1}^{5} \gamma_{ik} D_{tk} + \varepsilon_{it} \quad \ldots\ldots (1)$$

where; R_{it} = Return on portfolio i on day *t* (331 working day observations from September 5, 2007 to December 31, 2008).

Rm_t = Return on S&P 500 composite index at time period *t*

α_i = The intercept coefficient for industry *i*

β_i = Market risk coefficient for industry *i*

δ_i = Long-term interest rate risk coefficient for industry *i*

θ_i = Short-term interest rate risk coefficient for industry *i*

μ_i = The exchange rate return coefficient for industry *i*

D_t = Dummy variable which is equal to one in every event window and zero otherwise

ε_{it} = The random disturbances with *i* = 1; 2; . . . ; n representing n industry, and

k = 1; 2; . …. . ; 5 representing five event days.

This model uses a system of Seemingly Unrelated Regressions (SUR). It adjusts for the increases in variance of abnormal returns and the correlations of the returns of the firms under the same industry. Estimates under this model are more consistent than that of under ordinary least squares. Another major advantage of this model is that it allows testing cross equation restrictions. The estimates of β_i in equation (1) measures the systemic risk in each industry and δ_i, θ_I, and μ_i measures the sensitivity of long-term interest rate, short-term interest rate and exchange rate.

For the purpose of testing for too-big-to-fail aspect of AIG and effects on systemic risk, we follow an alternative model –

$$R_{it} = \alpha_i + \beta_{it} Rm_t + \delta_{it} Rlr_{it} + \theta_{it} Rsr_t + \mu_{it} Rex_t + \sum_{m=1}^{3} \varphi_{im} D_m + \varepsilon_{it} \quad \ldots\ldots (2)$$

where, φ_{im} is the abnormal returns of three different sub-periods m (= 1,2,3). We divide the sample period into three sub-periods – (i) From September 5, 2007 to February 27, 2008; before the crisis period until when AIG does not disclose material unrealized losses to its swaps portfolio, (ii) from February 28, 2008 to September 15, 2008; the crisis period when AIG disclose material unrealized losses to its swaps portfolio, and (iii) from September 16 to December 31, 2008; the aftermath of Federal Reserve's bailout decision.

The daily return data of each firm in four financial industries – banking (SIC 6020, 6022), insurance (SIC 6310, 6330, 6331, 6350 and 6351), brokerage firms (SIC 6021), and savings and loan institutions (S&Ls) (SIC 6035 and 6036) are collected for the period September 5, 2007 to December 31, 2008. The starting date of the sample is about three months prior to the first event date and the ending date is three months after the last event date. Due to the fast information dissemination process, the market reacts soon after every announcement. For this reason, we use such short window to avoid announcement effect of other significant events in these industries. The return data are collected from the Center for Research in Security Prices (CRSP). We take the average of the returns of all firms in an industry on each day.

The one-month constant maturity treasury rate, the ten-year constant maturity treasury rate and the trade-weighted exchange rate index of major currencies is collected from the Federal Reserve Bank of St. Louis as a proxy for short-term interest rate, long-term interest rate and exchange rate return. The return on S&P500 composite index is collected from CRSP.

5. Hypotheses development

5.1 Differential effects

Hypothesis 1 tests for the importance and its magnitude of each event on different financial industries. We hypothesize that each event has significantly different impact on the four different financial industries. That is –

H1: $\gamma_{ik} \neq \gamma_{jk}$ *for all i,j (i ≠ j), the abnormal returns (jointly) of each industry is different from each other across event day k.*

5.2 Overall effects

For testing the impact of the overall crisis (not of individual events) we hypothesize that the overall net impact of the crisis is significant for each industry. So –

H2.1: $\sum_i \sum_j \gamma_{ij} \neq 0$ *for all k; the net abnormal return of all industries on all the events is significantly different from zero.*

H2.2: $\sum_{k=1}^{5} \gamma_{ij} \neq 0$*; the net abnormal returns of all events are significantly different from zero for each industry.*

5.3 Contagion effect

For testing contagion effect, we hypothesize that the net loss in each industry is not significantly different from another industry. The failure of one industry is also reflected in other related industries due to the contagion effect and for this reason; we should not be able to significantly differentiate the net loss of one industry from another industry.

H3.1: $\gamma_{ik} \neq 0$ *for industry i on event k.*

H3.2: $\sum_{k=1}^{5} \gamma_{ik} = \sum_{k=1}^{5} \gamma_{jk}\ (i \neq j),\ ;$ *the net abnormal returns of all events are not significantly different from each other.*

5.4 Federal Reserve's perception about AIG as 'too-big-to-fail':

In equation (2) we test this hypothesis by restricting the coefficients of sub-period dummies (φ_{im}). If AIG is actually 'too-big-to-fail', then there should be appositive reaction in the market in the second sub-period (the crisis period) followed by a negative reaction in the third sub-period (after the bailout by the Federal Reserve). Thus we hypothesize that –

H4: $\varphi_{i2} > 0$ *and* $\varphi_{i3} < 0$*; positive reaction in the market during the crisis period (the second sub-period) and negative reaction in the post-bailout period (the third sub-period) due to the involvement of the Federal Reserve.*

5.5 Effects on systemic risk

We estimate equation (3) for testing the effects of the announcements on the systematic risk during the crisis period (the second sub-period), and the post-bailout period (the third sub-period):

$$R_{it} = \left(\alpha_i + \alpha_{i,cri}\, D_{cri}\right) + \left(\beta_i + \beta_{i,cri}\, D_{cri} + \beta_{i,af}\, D_{af}\right) Rm_t + \delta_{it}\, Rlr_{it} + \theta_{it}\, Rsr_t + \mu_{it}\, Rex_t + \varepsilon_t \quad \ldots \quad \ldots. \quad \ldots \quad \ldots. \quad \ldots \quad \ldots. \quad \ldots \quad \ldots. \quad \ldots \quad \ldots. \quad \ldots \quad \ldots. \quad \ldots \quad \ldots. \quad (3)$$

where, D_{cri} is a dummy variable equals 1 for the crisis period (the second sub-period) and 0 otherwise. D_{af} is a dummy variable equals 1 for the post-bailout period (the third sub-period) and 0 otherwise. Thus β_i indicates the systematic risk of an industry before the crisis, and $\beta_{i,cri}$ and $\beta_{i,af}$ are incremental risks during and after the crisis period respectively so that $(\beta_i + \beta_{i,cri})$

and ($\beta_i + \beta_{i,af}$) can capture the systemic risks of an industry during, and after the crisis period. In this case, $\beta_{i,cri}$ captures the incremental systemic risk for the crisis sub-period and $\beta_{i,af}$ captures the same for the post-bailout sub-period. We expect an increase in incremental risk during the crisis sub-period. Risk should fall with the Federal Reserve's innovation, and so the systemic risk after this should be lower than that of in the crisis sub-period. Thus we hypothesize that –

H5.1: $\beta_i \neq \beta_{i,cri}$*; the systemic risk in the crisis sub-period is significantly different from the pre-crisis period.*

H5.2: $\beta_{i,cri} \neq \beta_{i,af}$ *; the systemic risk during and after the crisis sub-period is significantly different from each other.*

6. Results:

Table 2 presents the summary statistics of the returns of four industries – banking, brokerage, insurance and savings and loans institutions (S&L). The total number of firms is 572, of which 292 firms belong to the banking industry, 87 firms belong to the brokerage industry, 84 firms belong to the insurance industry and 109 firms belong to the S&L industry. For the sample period, all the industries earn negative average returns along with S&P 500 index and 10-year Treasury Securities. On the other hand, 1-month Treasury Securities and trade-weighted exchange rate index earn positive average returns. The loss in market return (S&P 500) is 0.135% with a standard deviation of 2.326%. The average highest loss in return is in S&L industries (-0.145%) with a standard deviation of 5.19%, while the lowest average loss in return is in insurance industry (-0.029%) with a standard deviation of 4.689%. The return and standard deviation of ten year treasury securities (constant maturity) are (-0.186%) and 2.35%, 1-month treasury securities (constant maturity) are 6.559% and 57.992% and the trade-weighted exchange

rate index of major currencies are 0.009% and 0.645%, respectively. Thus 1-month Treasury Security is the most volatile securities in the market while 10-year Treasury Security is the least volatile one.

6.1: Differential effects of each event

Table 3 presents the estimates by the seemingly unrelated regressions (SUR) according to equation (1). The results show that the market return (S&P 500) is negative and significant (5% level) for the returns of banking and brokerage industries. But insurance and S&L industries do not seem to be sensitive towards the market response regarding the near collapse of AIG. The short run interest rate has highly significant (1% level) impact on the brokerage and S&L industry, but banking and insurance industry do not seem to be sensitive towards the short run interest rate risk. On the other hand, the long run interest rate is highly significant (1% level) for all four industries. All of the four financial industries are highly sensitive towards the long term interest rate risk. This finding is consistent with the findings of Mamun, Hassan and Johnson (2010). This result is probably driven by the long term portfolio of the firm assets of these industries. None of the industries seem to be sensitive towards shocks in exchange rate risk.

The first three events do not seem to have any announcement effect on any of the financial industries. But the latter two events (September 16, 2008 and October 8, 2008) are significant. The signs are consistent to the expected sign for September 16, 2008 when the Federal Reserve announces the bailout to save AIG. This announcement of the Federal Reserve has a positive significant effect, indicating that it brought some ray of hope for the investors. The low level of significance (10% level) may be due to the persistent uncertainty about the future economic

prospect. The announcement by the Federal Reserve on October 8, 2008 (the final event) to pledge additional bailout to AIG, has a significant negative impact on all four industries. Instead of gaining trust on the market, investors lose it as this announcement principally reassured their apprehension not to have the economy recovered very soon. Nippani and Smith (2010) also find these two specific events highly significant.

Table 3 also present the test of hypothesis 1 and it indicates that only the last event (October 8, 2008) has a significantly different impact on all the four different financial industries. The joint abnormal returns of each industry is significantly (5% level) different from each other only on this event date. The test of hypothesis 2 indicates that the net abnormal return of all industries on all the event dates is not significantly different from zero (we cannot accept H2.1). Moreover the net abnormal returns of all events are not significantly different from zero for each industry (again we cannot accept H2.2).

6.2 Test of contagion effects

Table 4 presents the result for the test of hypothesis 3.1. Again we find that the abnormal return of event 4 (September 16, 2008) and event 5 (October 8, 2008) are the significant ones; the abnormal return for four industries on these two days are significantly different from zero. This indicates that the economy seems to experience the contagion effects mainly after the crisis period. Table 5 presents the results for the test of hypothesis 3.2. From this table we find that the net abnormal return of the insurance industry for all the events combined together is significantly (5% level) different from the banking industry. This indicates a contagion effect of the near collapse of AIG on the banking industry. Other industries do not seem to be significantly

affected by the near collapse of AIG. This finding is consistent with that of Kabir and Hassan (2005), who also find significant contagion effect due to the near collapse of LTCM in 1998.

6.3 Test of too-big-to-fail hypothesis

Table 6 presents the test of the Federal Reserve's perception of AIG a too-big-to-fail. From equation (2), we expect the coefficients of the crisis period to be significantly negative and the post-bailout period to be significantly positive. The results indicate no significant evidence favoring the too-big-to-fail hypothesis. Although the market reacts positively in the crisis period and negatively in the post-bailout period, indicating results consistent with the expected signs, but the lack of significance put a doubt on the Federal Reserve's perception of AIG as too-big-to-fail. This result may be driven by the Federal Reserve's strong intention to stop the spillover effect and recover the economy, irrespective of the size of AIG.

6.4: Test of systemic risk

Table 7 presents the results for hypothesis 5 from the estimation of equation (3). Panel A of Table 7 indicates that even after controlling for the market return the post-bailout period suffers significant systemic risk. The interaction variable '*S&P 500* x D_{af}' is significant for all the four industries at 1% level. On the other hand the crisis period does not suffer from significant systemic risk. Panel B of Table 7 presents the results of hypothesis 5.1. The results indicate that we cannot accept H5.1 as there is no significant difference between the systemic risk before and during the crisis period. Again we find evidence to accept H5.2; that is for all the four industries, the systemic risk during the crisis period is significantly different from that of after the crisis period. So we see significantly differential systemic risk after the crisis period. Again this finding

is consistent with the previous results regarding the contagion effect of AIG and also with the findings of Kabir and Hassan (2005).

7. Conclusion

The failure of AIG during 2007 and 2008 contributed significantly in the recent financial crisis. But the Federal Reserve decided to bailout AIG as a huge number of economic stakes are involved with its future. For this the Federal Reserve Bank of New York injects about $150 billion to help AIG to survive. We analyze the impact of the announcements of AIG's failure and Fed's innovation on the financial industry - banking, insurance, brokerage firms and savings and loan institutions (S&Ls). Five event dates are selected and the effects of these event announcements on the four industries are tested by using a seemingly unrelated regression method. The results indicate that that the Federal Reserve's announcement on September 16, 2008 and October 8, 2008 regarding the pledge of $85 billion and $37.8 billion has the most impact on the financial market. Moreover, both the short run interest rate and the long run interest rate have some significant impact on the returns of these four industries. The market return is also a contributory factor for the industry return.

We find some evidence of contagion effect between the Insurance and the Banking industry. The market experiences such contagion effect mainly in the post-bailout period. But we do not find any significant evidence regarding the Federal Reserve's perception of AIG as too-big-to-fail. We also document significant evidence of systemic risk in the post-bailout period, where the systemic risk is significantly different from the crisis period.

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Table 1: Major Events for the Study

No.	Event Date	Event	Expected Sign
1	December 5, 2007	AIG discloses $1.05 billion to $1.15 billion in unrealized losses to its swaps portfolio	-
2	February 28, 2008	AIG declares writing down of $11.5 billion CDSs. Joe Cassano resigned.	-
3	August 6, 2008	AIG raises its unrealized loss in 2008 from the credit default swaps to $14.7 billion	-
4	September 16, 2008	The Fed saves AIG by pledging $85 billion	+
5	October 8, 2008	The Fed pledges another $37.8 billion to AIG	+

Table 2: Summary Statistics

Variables	Obs.	Mean Return	Std. Dev. Return	Minimum Return	Maximum Return
Banking Ind.	292	-0.106	5.379	-85.714	262.000
Brokerage Ind.	87	-0.134	5.852	-81.600	186.957
Insurance Ind.	84	-0.029	4.689	-46.569	74.632
S&L Ind.	109	-0.145	5.190	-90.509	192.333
S&P500	331	-0.135	2.326	-9.035	11.580
10-Yr Treasury	331	-0.186	2.35	-8.284	6.780
1-Month Trsury.	331	6.559	57.992	-73.723	537.500
Exchange Index	331	0.009	0.645	-2.955	2.178

This table presents the summary statistics of the returns of four industries used in the samples as well as the return of S&P500 Index, ten year treasury securities (constant maturity), one month treasury securities (constant maturity), and the trade-weighted exchange rate index of major currencies respectively. The banking, brokerage, insurance and savings and loan Institutions (S&Ls) sector have 292, 87, 84 and 109 firms in the sample period of September 5, 2007 to December 31, 2008. All the numbers except for observation are expressed in percentage.

Table 3: Effect of AIG's and Federal Reserve's Announcements on Four Industries (Seemingly Unrelated Regressions Estimate)

Variable	Coefficient				H1:$\gamma_{ik} \neq \gamma_{jk}$ $\forall i,j\ (i \neq j)$
	Banking	**Broker**	**Insurance**	**S&L**	**F-Statistic**
Intercept	-0.00083	-0.00123	-0.00004	-0.00134*	
	(0.386)	(0.252)	(0.974)	(0.088)	
SP500	-0.08905**	-0.09166**	-0.08025	-0.02811	
	(0.031)	(0.046)	(0.137)	(0.399)	
Rsr	0.00245	0.00552***	0.00338	0.00415***	
	(0.135)	(0.003)	(0.117)	(0.002)	
Rlr	0.35655***	0.41479***	0.41838***	0.29206***	
	(0.000)	(0.000)	(0.000)	(0.000)	
Rex	-0.10803	-0.08028	-0.23891	-0.04494	
	(0.463)	(0.625)	(0.217)	(0.707)	
D (event 1)	0.00911	0.00262	0.00296	0.00566	0.36
	(0.596)	(0.892)	(0.895)	(0.685)	(0.783)
D (Event 2)	-0.00023	0.00413	-0.00077	-0.00315	0.20
	(0.989)	(0.830)	(0.973)	(0.822)	(0.898)
D (Event 3)	0.00435	0.00528	-0.0113	0.01062	0.83
	(0.800)	(0.783)	(0.616)	(0.447)	(0.477)
D (Event 4)	0.03089*	0.03802**	0.03816*	0.02703*	0.52
	(0.073)	(0.049)	(0.092)	(0.054)	(0.669)
D (Event 5)	-0.03688**	-0.04983**	-0.06939***	-0.03448**	3.65**
	(0.035)	(0.011)	(0.003)	(0.015)	(0.012)
H2.1: $\sum_i \sum_j \gamma_{ij} \neq 0$ $\forall k$, (F-Statistic)			0.03		
			(0.864)		
H2.2: $\sum_{k=1}^{5} \gamma_{ij} \neq 0$ (F-Statistic)	0.04	0.000	0.63	0.03	
	(0.843)	(0.996)	(0.428)	(0.857)	

This table presents the estimation of the following system of equations for seemingly unrelated regressions (SUR) – $R_{it} = \alpha_i + \beta_i\, Rm_t + \delta_i\, Rlr_t + \theta_i\, Rsr_t + \mu_i\, REx_t + \sum_{k=1}^{k} \gamma_{ik}\, D_{tk} + \varepsilon_{it}$. The model is estimated for four financial industries - banking, insurance, brokerage firms and Savings and Loan Institutions (S&Ls). Here R_{mt} is the market return (S&P500 composite index), Rlr_t is the long run interest rate (ten-year constant maturity treasury rate), Rsr_t is the short run interest rate (one-month constant maturity treasury rate) and Rex_t is the exchange rate return

(trade-weighted exchange rate index of major currencies). D_{kt} is a dummy variable equals one over the event windows. The coefficient of dummy (γ_{ik}) estimates the cumulative average abnormal return of the *k*th event. This table analyzes five events. The last column presents the test of hypothesis that each event has significantly different impact on four different industries in the sample. The p-values are presented in parentheses.
***, **, and * represents significance at 1%, 5% and 10% level, respectively.

Table 4: Contagion Effects of Each Different Event on Each Different Industry

H3.1: $\gamma_{ik} \neq 0$ $\forall i$ *on k.*	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**
Bank	0.28	0.00	0.06	3.23*	4.5**
	(0.596)	(0.999)	(0.800)	(0.073)	(0.034)
Brokerage	0.02	0.05	0.08	3.92**	6.59***
	(0.892)	(0.830)	(0.783)	(0.048)	(0.010)
Insurance	0.02	0.00	0.25	2.86*	9.25***
	(0.895)	(0.973)	(0.616)	(0.091)	(0.002)
S&L	0.16	0.05	0.58	3.74*	5.95**
	(0.685)	(0.822)	(0.447)	(0.053)	(0.015)

This table presents the results of the test of hypothesis 3.1: $\gamma_{ik} \neq 0$ $\forall i$ *on event k,* where i = 1, 2, …, 4 representing Banking, Brokerage, Insurance, and Savings and Loans (S&L) industries, and k = 1, 2, …, 5 representing the five event dates. The first entry for each event presents the F-statistic of the test and the second entry in the parentheses presents the corresponding p-value.

***, **, and * represents significance at 1%, 5% and 10% level, respectively.

Table 5: Contagion Effects: Net Abnormal Returns of All Events

H3.2: $\sum_{k=1}^{5}\gamma_{ik} = \sum_{k=1}^{5}\gamma_{jk}$.	**Brokerage**	**Insurance**	**S&L**
Bank	0.18	3.95**	0.01
	(0.671)	(0.047)	(0.911)
Brokerage		2.00	0.06
		(0.157)	(0.806)
Insurance			2.05
			(0.152)

This table presents the results of the test of hypothesis 3.2: $\sum_{k=1}^{5}\gamma_{ik} = \sum_{k=1}^{5}\gamma_{jk}\ i \neq j$, where i = 1, 2, …, 4 representing Banking, Brokerage, Insurance, and Savings and Loans (S&L) industries. The first entry for each event presents the F-statistic of the test and the second entry in the parentheses presents the corresponding p-value. ***, **, and * represents significance at 1%, 5% and 10% level, respectively.

Table 6: Too-Big-to-Fail Hypothesis; As Perceived by the Federal Reserve (Seemingly Unrelated Regressions Estimate)

Variable	Coefficient			
	Banking	**Broker**	**Insurance**	**S&L**
Intercept	-0.00085	-0.00126	-0.000074	-0.00135*
	(0.381)	(0.249)	(0.955)	(0.089)
SP500	-0.08507**	-0.08633*	-0.07325	-0.0249
	(0.040)	(0.063)	(0.180)	(0.461)
Rsr	0.00247	0.00554***	0.00342	0.00416***
	(0.136)	(0.003)	(0.118)	(0.002)
Rlr	0.34598***	0.40063***	0.39974***	0.28355***
	(0.000)	(0.000)	(0.000)	(0.000)
Rex	-0.10376	-0.07556	-0.23543	-0.03914
	(0.484)	(0.649)	(0.229)	(0.747)
D (Sub-Period 1)	0.00918	0.00271	0.00309	0.00572
	(0.596)	(0.889)	(0.893)	(0.686)
D_{cri} (Sub-Period 2)	0.000214	0.00449	-0.00631	0.00362
	(0.431)	(0.372)	(0.349)	(0.359)
D_{af} (Sub-Period 3)	-0.00264	-0.00542	-0.01497	-0.00344
	(0.416)	(0.348)	(0.180)	(0.368)

This table presents the estimation of the following system of equations for seemingly unrelated regressions (SUR) – $R_{it} = \alpha_i + \beta_{it}\, Rm_t + \delta_{it}\, Rlr_{it} + \theta_{it}\, Rsr_t + \mu_{it}\, Rex_t + \sum_{m=1}^{3} \varphi_{im}\, D_m + \varepsilon_{it}$. The model is estimated for four financial industries - banking, insurance, brokerage firms and Savings and Loan Institutions (S&Ls). Here R_{mt} is the market return (S&P500 composite index), Rlr_t is the long run interest rate (ten-year constant maturity treasury rate), Rsr_t is the short run interest rate (one-month constant maturity treasury rate) and Rex_t is the exchange rate return (trade-weighted exchange rate index of major currencies). *Dm* is a dummy variable equals one over the three sub-period event windows. The coefficient of dummy (φ_{ik}) estimates the cumulative average abnormal return of the *k*th event. This table analyzes five events. The p-values are presented in parentheses. For the test of H4, we employ one-tailed test for D_{cri} and D_{af}.

***, **, and * represents significance at 1%, 5% and 10% level, respectively.

Table 7: Effect of AIG's and Federal Reserve's Announcements on Four Industries (Seemingly Unrelated Regressions Estimate)

Variable	Coefficient			
	Banking	**Broker**	**Insurance**	**S&L**
Panel A				
Intercept	-0.00080	-0.00123	-0.00003	-0.00132*
	(0.403)	(0.253)	(0.979)	(0.092)
SP500	-0.08852**	-0.09150**	-0.08007	-0.02778
	(0.031)	(0.046)	(0.137)	(0.405)
Rsr	0.00244	0.00551***	0.00338	0.00414***
	(0.136)	(0.003)	(0.116)	(0.002)
Rlr	0.35712***	0.41495***	0.41856***	0.29241***
	(0.000)	(0.000)	(0.000)	(0.000)
Rex	-0.10851	-0.08042	-0.23906	-0.04524
	(0.460)	(0.624)	(0.216)	(0.705)
Dcri (Sub-Period 2)	0.00313	0.00494	-0.00828	0.00664
	(0.812)	(0.738)	(0.633)	(0.536)
Daf (Sub-Period 3)	-0.00342	-0.00640	-0.01622	-0.00409
	(0.780)	(0.640)	(0.314)	(0.681)
S&P500 x D_{cri}	-0.21192	-0.05910	0.54341	-0.70986
	(0.866)	(0.966)	(0.741)	(0.486)
S&P500 x D_{af}	2.48211***	3.21672***	3.93769***	2.70986***
	(0.006)	(0.001)	(0.001)	(0.002)
Panel B: F-statistic				
H5.1: $\beta_{before} \neq \beta_{crisis}$	0.01	0.00	0.14	0.45
	(0.922)	(0.982)	(0.705)	(0.503)
H5.2: $\beta_{crisis} \neq \beta_{after}$	3.10*	3.67*	2.85*	5066**
	(0.079)	(0.056)	(0.091)	(0.018)

Panel A of this table presents the estimation of the following system of equations for seemingly unrelated regressions (SUR) –

$R_{it} = (\alpha_i + \alpha_{i,cri}\, D_{cri}) + (\beta_i + \beta_{i,cri}\, D_{cri} + \beta_{i,af}\, D_{af})\, Rm_t + \delta_{it}\, Rlr_{it} + \theta_{it}\, Rsr_t + \mu_{it}\, Rex_t + \varepsilon_t$. The model is estimated for four financial industries - banking, insurance, brokerage firms and Savings and Loan Institutions (S&Ls). Here R_{mt} is the market return (S&P500 composite index), Rlr_t is the long run interest rate (ten-year constant maturity treasury rate), Rsr_t is the short run interest rate (one-month constant maturity treasury rate) and Rex_t is the

exchange rate return (trade-weighted exchange rate index of major currencies). D_{cri} is a dummy variable equals one over the second sub-period (the crisis period) and D_{af} is a similar dummy variable equals one over the last sub-period (the aftermath of the Federal Reserve's innovation). Panel B of the table provides the test of systemic risk before, during and after the crisis period. The p-values are presented in parentheses.
***, **, and * represents significance at 1%, 5% and 10% level, respectively.