

# REVERSE EVENT STUDY: BANK STOCKS AND THE FINANCIAL CRISIS

**Robert Balik**

Finance and Commercial Law Department  
Haworth College of Business  
Western Michigan University  
1903 West Michigan Ave  
Kalamazoo, MI 49008  
e-mail: robert.balik@wmich.edu  
telephone: +1 269 387 5674

## Abstract

*During the recent financial crisis, there were many significant events. An example of a significant event was the bankruptcy of Lehman Brothers on 15 September 2008. This research uses a reverse event study method to investigate the relationship between these events and abnormal daily stock returns. Instead of estimating abnormal daily rates of return around a known event day the abnormal rates of return are used to determine the event dates. The sample studied is ten of the United States banks with the most total assets. The two dates on which the most of these financial institutions had significant negative actual and abnormal daily rates of return were 29 September 2008 and 1 December 2008.*

**Keywords:** Financial crisis, reverse event study, abnormal rates of return

**JEL codes:** G14, G21, G24

## 1 Introduction

During 2008 a few of the important financial crisis events were:

- March 17, Investment bank Bear Stearns is rescued by rival bank JP Morgan Chase.
- September 7, US government rescues Fannie Mae and Freddie Mac.
- September 15, Lehman Brothers goes bankrupt.
- October 3, \$700 billion bailout approved by Congress.
- December 16, Federal Reserve cuts key interest rate to near zero.

Which of these events, or others, had the greatest impact on the prices of the largest U. S. banks? In addition to looking for the days with the largest daily rate of return an reverse event study method is used. The procedure for a typical event study is to define an event,

such as stock splits, and estimate abnormal rates of returns for a portfolio of stocks around this event. A reverse event study takes a group of stocks and attempts to find those dates that had a significant impact on the rate of return. And then check to see what events took place on those dates.

## 2 Motivation

The ongoing financial crisis, whose significant impacts took place during the last quarter of 2008, is related to the housing bubble that peaked in 2006. An important question is: When was this information reflected into the common stock of the largest U. S. banks.

## 3 Method

The literature mentions a couple of ways to conduct a reverse event study. Ellison and Mullin (2001) use isotonic regression (Barlow, Bartholomew, Bremner, and Brunk, 1972). They used this method to find those days that had a significant impact on the price of the common stock of pharmaceutical firms when President Clinton attempted health care reform. The period studied was from January 1992 through October 1993.

Willard, Guinnane, and Rosen (1995) used the reverse event study to relate significant changes in the unit price of gold expressed in Greenbacks to important events during the Civil War. They discuss several reverse event study procedures. One procedure uses the data for the entire time period to estimate the following equation

$$R_t = \beta_0 + \sum_{i=1}^{12} \beta_i \times R_{t-i} + \varepsilon_i$$

where

$R_t$  is the rate of return on day t

$R_{t-i}$  is the rate of return on day t - i

$\varepsilon_i$  is the residual

$\beta_0$  is the residual

$\beta_i$  is the coefficient for day i

(1)

The extreme residuals determine the event days.

This research does the following:

- Finds the trading dates from beginning of 2006 through the end of 2008 that had the smallest (most negative) raw daily rates of return.
- Uses the above reverse event study in Willard, Guinnane, and Rosen, (1995) to find those event days with the most negative residuals.
- Compares the results in steps 1 and 2.

## 4 Data and Model

Table 1 is the list of 10 banks whose common stock is analyzed. In 2005 these were 10 of the largest banks in the U.S. Total assets was used as the measure of size.

**Table 1: List of banks studied**

Obs.	Name of Bank
1	Citigroup
2	Bank Of America
3	J.P.Morgan Chase & Co.
4	Wells Fargo & Co.
5	U.S. Bancorp
6	Sun Trust Banks, Inc
7	Bank of New York Co. Inc
8	BB&T Corp
9	Fifth Third Bancorp
10	Key Corp

Key information about the data for the 10 firms:

- 1) Daily closing stock prices were obtained from yahoo finance. These stock prices are adjusted for both stock splits and stock dividends. These closing prices were used to calculate the daily rates of return.
- 2) The proxy for the stock market is the S&P 500 index.
- 3) The period studied is from first trading day in 2006 through the last trading day in 2008.

## 5 Results

Table 2 indicates the raw percentage return for each stock for this three-year period.

**Table 2: Three year raw rates of return, 2006 -**

Obs.	Name of Bank	Rate
1	Citigroup	-84.117%
2	Bank Of America	-63.842%
3	J.P.Morgan Chase & Co.	-12.426%
4	Wells Fargo & Co.	4.364%
5	U.S. Bancorp	-2.987%
6	Sun Trust Banks, Inc	-53.584%
7	Bank of New York Co. Inc	-9.745%
8	BB&T Corp	-24.206%
9	Fifth Third Bancorp	-74.932%
10	Key Corp	-70.278%

That is, from the beginning of 2006 through the end of 2008 the overall rate of return on Citigroup common stock was -84.117%. This means an investment of \$10,000 in the common stock of Citigroup at the beginning of 2006 was worth \$1,588.30 at the end of 2008. Wells Fargo is the only bank with a positive three year rate of return, +4.364.

Table 3 contains the 10 smallest (most negative) daily rates of return for the S&P 500 index during the three years 2006 – 2008 and the day that each occurred.

**Table 3: S&P 500 Index, 10 smallest rates of return with corresponding dates.**

	Rate of Return	Date
1	-9.035%	15/10/2008
2	-8.930%	01/12/2008
3	-8.807%	29/09/2008
4	-7.617%	09/10/2008
5	-6.712%	20/11/2008
6	-6.116%	19/11/2008
7	-6.101%	22/10/2008
8	-5.739%	07/10/2008
9	-5.268%	05/11/2008
10	-5.189%	12/11/2008

The 10 most negative daily rates of return are from -5.189% on 12 November 2008, to -9.035% on 15 October 2008. All of the above rates of return except one occur in the fourth quarter of 2008. The exception is -8.807% on 29 September 2008.

Table 4 contains the smallest (most negative) and second smallest (most negative) un-adjusted or raw daily rate of return and the dates on which they occurred for the S&P 500 index the 10 bank stocks, and the average of the 10 stocks. For the 10 common stocks 5 of the 20 daily rates of return occurred on 29 September 2009 and another 5 of the 20 occurred on 1 December 2008.

**Table 4: Un-adjusted return data for S&P 500 Index, 10 bank stocks, and average of 10**

Obs.	Name of Bank	Smallest		2nd Smallest	
		Rate	Date	Rate	Date
1	S&P 500	-9.0350%	15/10/2008	-8.9295%	01/12/2008
2	Citigroup	-	20/11/2008	-23.5012%	19/11/2008
3	Bank Of America	-	07/10/2008	-21.3070%	15/09/2008
4	J.P.Morgan Chase & Co.	-	20/11/2008	-17.4872%	01/12/2008
5	Wells Fargo & Co.	-	01/12/2008	-14.5759%	09/10/2008
6	U.S. Bancorp	-	01/12/2008	-10.2243%	11/12/2008
7	Sun Trust Banks, Inc	-	29/09/2008	-20.6743%	01/12/2008
8	Bank of New York Co.	-	29/09/2008	-15.8544%	15/10/2008
9	BB&T Corp	-	29/09/2008	-16.4854%	01/12/2008
10	Fifth Third Bancorp	-	29/09/2008	-28.7356%	24/10/2008
11	Key Corp	-	29/09/2008	-28.6359%	09/10/2008
12	Average, 10 Banks	-	29/09/2008	-18.1417%	01/12/2008

Table 5 contains results of the reverse event study procedure. These are the five most negative residuals from the regression that used the average daily rate of return for all 10 banks for all trading days in 2008. Each residual is the difference between the actual average daily rate of return for the 10 stocks and the average daily rate of return that the model predicts. The most negative daily rate of return, -18.40%, occurs on 9 September 2008. This corresponds to one of the most common dates in Table 4. The other most common date in Table 4, 1 December 2008, is also the last date in Table 5. Finally, all of the dates in Table 5 also occur in Table 4.

**Table 5: Reverse Event Procedure, all banks**

Obs	Residual	Date
1	-18.40%	29/09/2008
2	-14.20%	20/11/2008
3	-13.67%	09/10/2008
4	-13.63%	07/10/2008
5	-13.46%	01/12/2008

Table 6 has the reverse event study residuals for Citicorp. The two dates, 20 November 2008 and 19 November 2008, for Citicorp that appear in Table 4 also are the 1st and 3rd dates in Table 6. Also, the first three dates in Table 6 are the three consecutive dates, 19, 20, and 21 in November 2008.

**Table 6: Reverse Event Procedure, Citicorp**

Obs	Residual	Date
1	-28.83%	20/11/2008
2	-24.58%	21/11/2008
3	-24.06%	19/11/2008
4	-16.53%	03/10/2008
5	-15.51%	15/09/2008

Table 7 has the reverse event study residuals for Bank of America. The two dates, 7 October 2008 and 15 September 2008, for Bank of America that appear in Table 4 also are the 1st and 2nd dates in Table 7. All of the dates in Table 7 appear in Table 4.

**Table 7: Reverse Event Procedure, Bank of**

Obs	Residual	Date
1	-23.49%	07/10/2008
2	-20.27%	15/09/2008
3	-18.00%	01/12/2008
4	-15.77%	29/09/2008
5	-14.62%	20/11/2008

In summary, the dates for the large negative residuals for the three reverse study regressions correspond to dates in the large negative raw daily rates of return. This enhances the credibility of the reverse event study procedure used.

The two most common event dates are 29 September 2008 and 1 December 2009. The following are some of the events that occurred on these two dates (<http://timeline.stlouisfed.org/index.cfm?p=timeline>).

### ***5.1 29 September 2008:***

- The FOMC authorizes a \$330 billion expansion of swap lines with Bank of Canada, Bank of England, Bank of Japan, Danmarks Nationalbank, ECB, Norges Bank, Reserve Bank of Australia, Sveriges Riksbank, and Swiss National Bank Swap lines outstanding now total \$620 billion.
- The Federal Reserve Board expands the TAF, announcing an increase in the size of the 84-day maturity auction to \$75 billion and two forward TAF auctions totaling \$150 billion to provide short-term (one- to two-week) TAF credit over year-end.
- The U.S. Treasury Department opens its Temporary Guarantee Program for Money Market Funds [see note for September 19]. The temporary guarantee program provides coverage to shareholders for amounts that they held in participating money market funds as of the close of business on September 19, 2008.
- The FDIC announces that Citigroup will purchase the banking operations of Wachovia Corporation. The FDIC agrees to enter into a loss-sharing arrangement with Citigroup on a \$312 billion pool of loans, with Citigroup absorbing the first \$42 billion of losses and the FDIC absorbing losses beyond that. In return, Citigroup would grant the FDIC \$12 billion in preferred stock and warrants.
- The U.S. House of Representatives rejects legislation submitted by the Treasury Department requesting authority to purchase troubled assets from financial institutions.

### ***5.2 1 December 2008:***

- Economists with the nonprofit National Bureau of Economic Research announce that the U.S. economy entered a recession in December 2007. Stocks plunge in response.
- Treasury Secretary Henry Paulson says that the administration is looking for more ways to tap a \$700 billion financial rescue program, while Federal Reserve Chairman Ben Bernanke says that he is inclined to keep cutting interest rates to try to contain damage from the downturn.

- The Big Three automakers rush to prepare new business plans to present to Congress in a bid for \$25 billion in federal aid.
- Gas prices fall for the 75th straight day to a national average of \$1.82 per gallon, the cheapest price since January 2005.
- Dow Jones Industrial Average: -679.95

## 6 Conclusion

Since this financial crisis contains events whose related one day raw rates of return are large, frequently exceeding 10%, this research can be considered a test of the ability of the reverse event method. That is, of the ability of the reverse event method to select the “most important” event days.

Issues for future research:

- Check the other reverse event study methods in Willard, Guinnane, and Rosen, (1995).
- Check the reverse study method in Ellison and Mullin (2001).
- Include other banks such as firms that use to be mostly investment banks.



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