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Evaluation of the Federal Reserve's financial-crisis timeline

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ABSTRACT

The present paper evaluates the effect that the events and policy actions important for the Federal Reserve had in five US financial markets. Analysis concentrates on events starting from February 2007 up to August 2009, as dictated by the financial-crisis timeline of the Federal Reserve Bank of St. Louis. Evaluation is indicated via an economic and statistical significance criterion. The former is based on Sharpe-ratio and the latter on Welch's *t*-test. Robustness of the latter criterion as appropriate for event evaluation is provided via a Kolmogorov–Smirnov test. An overall comparative analysis across the board of categories of the financial events is provided as well. Are there categories of events more significant than others? Is it fiscal decisions or policy actions that more significantly affect US financial markets? Results suggest that academics, economists and financiers re-think the significance of some of the events and policy decisions. Analysis is implemented in the following US financial markets: stock spot indices, stock index futures, Exchange Traded Funds, US Treasury bond futures and spot exchange rates.

1. Introduction

The financial crisis, as considered by the academic and professional finance society, took place on the 15th of September 2008. The literature for the recent financial crises is as wide as expected for the magnitude of the impact to regional economies and financial markets globally.

The financial-crisis literature mostly concentrates on the feedforward and feedback loops between the banking industry (mostly the European one) and crisis or events related to crisis (market-surprises events and policy making events). Recently, Caprio, DâApice, Ferri, and Puopolo (2014) provided a cross-country and cross-bank analyses of the financial determinants of the 2008 financial crisis. Cohen, Cornett, Marcus, and Tehranian (2014) found that a pattern of earnings management in bank financial statements had high impact on downside risk during the financial crisis period. De Haas and Van Lelyveld (2014) provided evidence that parent banks were not a significant source of strength to their subsidiaries during the 2008–09 financial crisis. Albertazzi and Bottero (2014) highly exploited disaggregated bank-firm data to investigate the dynamics of foreign vs domestic credit supply in Italy around the period of the Lehman collapse. Efthyvoulou and Yildirim (2014) researched how the global financial crisis has affected the market power in Central and Eastern European banking markets.

Another part of the literature concentrates on the impact of the 2008 financial crisis or announcements related to it, in financial markets. Evans and Speight (2011) examined the impact of international announcements (with some of policy making events) in three euro exchange rates. Within an international framework, Lane and Milesi-Ferreti (2012) described the substantial widening of current account imbalances across the world for the period after the global financial crisis started. Tsay and Ando (2012) provided a Bayesian high-dimensional panel data analysis to identify common factors that explain the movement of US stock returns. Empirical evidence that the structure of US stock market has changed drastically after the subprime (Lehman Brothers) crisis is obtained.[1] Felices and Wieladek (2012) used a Bayesian dynamic common factor model to estimate the extent to which common factors underlie indicators of vulnerability to financial crises in both developing and developed countries. The sensitivity of credit supply to bank financial conditions in 16 emerging European countries before and during the financial crisis was analysed by Popov and Udell (2012). DeYoung and Torna (2013) tested whether income from traditional banking activities contributed to the failures of hundreds of US commercial banks during the financial crisis. However, another part of literature argued that the 2007 crisis was not a global crisis. Shehzad and de Haan (2013) investigated this argument through the examination of the stock prices of banks in either emerging or developed countries.[2] Among others, Hindmoor and McConnell (2013) discussed about the global financial crisis. According to them, it began in 2006 with the gradual fall in housing prices in some states of the

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[1] They divided the data span into the following three periods: (1) June 30, 2006 to June 29, 2007 denoting the period before the outbreak of the subprime crisis, (2) August 1, 2007 to August 29, 2008 denoting the period after the outbreak of the subprime crisis, but before the Lehman's failure, (3) October 1, 2008 to September 30, 2009 denoting the period after Lehman's failure.

[2] Their results used a base period from January 2006 up to December 2006. They split the crisis period into three time periods: from January 2007 to August 2008; from September 2008 to March 2009; and from April 2009 to June 2011.

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USA. The most important reason creating the crisis is the banking systems of some lead economies (especially European) which were heavily exposed to highly fragile investments in securitised credit markets. They were built upon risky sub-prime mortgage and short-term money markets. Development in financial markets is a dynamic process indeed. However, this nature could not have left the financial markets completely crisis proof. Instead of trying to identify a single crisis, it is more useful to examine the events and policy actions that resulted in the crisis effect.

The literature, apart from the relation between the banking industry and the crisis, of the impact of the 2008 crisis and/or announcements related to it on financial markets was also researched. However, the impact of Federal policy events has been extensively examined as well. Laopodis (2010) examined via VAR models the asymmetric effects of monetary policy actions on the stock market. The response of stock prices to Federal Reserve policy shocks was examined in a daily frequency (Chulia, Martens, & van Dijk, 2010) and in an intraday (Rosa, 2011) frequency. Central bank actions have been also signified in literature. Neely (2011) researched the impact of central bank interventions in intraday volatility. Hausman and Wongswan (2014) examined the impact of U.S. monetary policy announcement surprises in foreign equity indexes, short- and long-term interest rates, and exchange rates.

The present paper evaluates the events and policy actions as officially published by the Federal Reserve Bank of St. Louis. FED believes that these affected the crisis and entitled them as financial-crisis timeline. It is researched that six categories of these events mostly affected some of the most liquid and internationally influential US financial markets. According to the FED, the financial crisis started and was mostly caused by the events and policy actions between February 2007 and the end of July 2009. This period is the financial-crisis timeline analysed in the present paper. On each event day, there are events from one and only category of events. The time period between any two consecutive events is at least two days. Each and every event and policy action of the financial-crisis timeline is economically evaluated via a Sharpe-ratio criterion. Event statistical significance is examined via a Welch's *t*-test. Economic significance is indicated when the Sharpe ratio for a day after the event is higher than the corresponding value for a day before the event.[3] Economic significance is examined at each and every event day individually. Results upon significance are provided in summary across different categories of events. Events and policy actions are split into the following categories: Federal Reserve[4] (*FED*), US Securities and Exchange Commission (*SEC*), banks & corporations (*BC*), US and UK Treasury departments (*TR*), political actions (*PA*), and rating agencies (*RA*). Statistical significance is examined by a Welch's *t*-test between the Sharpe ratios before and those after an event. This test is capable of examining such a research question as far as the Sharpe ratios before and those after an event have different distributional properties, as revealed by a Kolmogorov–Smirnov test.

The rest of the paper is organized as follows. Section 2 describes data. Section 3 provides the methodology. Section 4 analyses the empirical findings, and Section 5 concludes.

2. Data description

Analysis concerns data series from four different US financial markets: (a) stock spot indices (Dow Jones Industrial Average: *INDU*, Nasdaq 100 Index: *NDX*, S&P 500 Index: *INX*, Nasdaq Composite Index: *COMPX*, Russell 2000 Index: *RUT*, S&P 100 Index: *OEX* and S&P 400 Midcap Index: *IDX*); (b) stock index futures (E-Mini S&P 500 Continuous Contract: *ES* and E-Mini Nasdaq 100 Continuous Contract: *NQ*); (c) Exchange Traded Funds (PowerShares QQQ: *QQQ*, SPDR S&P 500 Growth ETF: *SPY*, SPDR Dow Jones Industrial Average ETF: *DIA*, SPDR S&P MidCap 400 ETF: *MDY* and iShares Russell 2000 Index Fund: *IWM*); (d) US Treasury bonds futures (30-year US Treasury yield: *TYX*); and (e) spot exchange rates (US dollar spot index: *DXY*).

Trading (open outcry) hours for: stock spot indices (*INDU*, *NDX*, *INX*, *COMPX*, *RUT*, *OEX* and *IDX*) and ETFs (*QQQ*, *SPY*, *DIA*, *MDY* and *IWM*) are 9:30 am–4 pm eastern time (ET); stock mini-futures (*ES* and *NQ*) are 8:30 am–3:15 pm eastern time (ET); *TYX* are 7:30 am–2 pm eastern time (ET); and *DXY* are 2:00 am–11 pm eastern time (ET). The sampling frequency of data is 1 min. Week-ends and a set of fixed and irregular holidays, as well as the days with too many missing values are removed. Sample includes data from October 15, 2001 up to August 1, 2009. The evaluation takes place on the financial-crisis timeline of the FED. This ranges from February 1, 2007 up to August 1, 2009.[5]

The financial turmoil timeline is retrieved by the Federal Reserve Bank of St Louis. All these events are grouped into the following six categories: Federal Reserve (*FED*), US and UK Treasury departments (*TR*), banks & corporations (*BC*), US Securities and Exchange Commission (*SEC*), political actions (*PA*), and rating agencies (*RA*). Another category that includes all events and symbolised as *ALL* is researched as well. In order to indicate the importance of these groups of events, examples of each category are reported. *FED*: *SEC* begins investigation of 12 CDO issuers (June 28, 2007); *TR*: Northern Rock receives emergency loan from the Bank of England (September 13, 2007); *BC*: Term Auction Facility (TAF) is announced and swap lines are established with the ECB and SNB for $20 bn and $4 bn respectively (December 12, 2007); *SEC*: Treasury Secretary Paulson requests government funds to potentially support Fannie Mae and Freddie Mac (July 15, 2007); *PA*: *SEC* proposes a ban on naked short sharing (March 7, 2007); and *RA*: rating agencies threaten to downgrade Ambac Financial and MBIA, two major bond issuers (January 29, 2008). According to Tables 2A, 2B and 2C the *FED* category is probably the most influential as it accounts for 51% of all events. Second in-class is the *TR* category; followed by the *BC*, *SEC*, *PA* categories and last the *RA* one.

3. Methodology

3.1. Realized volatility estimation

Realized volatility is the best estimator of quadratic variation, which is the best estimate of integrated volatility, which in its turn is the best estimate of the true (but latent) volatility series. Andersen, Bollerslev, Diebold, and Labys (2001), ABDL hereafter, introduced the prototype of realized volatility estimator, which simply is the sum of all observable intraday squared returns within a trading day:

$$RV_t^{(m)} = \sum_{i=1}^{m} r_{i,m}^2 \tag{1}$$

where $r_{i,m}$ is the intraday return series, i indicates the 1-minute time period observation within a trading day t, and m is the total number of the 1-minute observations within a trading day and changes for each financial market. For stock spot indices and ETFs, m equals to 390; for stock mini-futures, equals to 405; for equals to 390 and for US dollar index, equals to 1260.[6]

[3] The immediate (in one day's time) impact of the event is targeted.

[4] In this category, events directly related to Federal decision makers are included. These are the Federal Reserve, the Federal Home Loan Mortgage corporation (Freddie Mac), the Federal Houing Finance Agency (FHFA), the Federal Deposit Insurance Corporation (FDIC), and the National Bureau of Economic Research (NBER).

[5] According to Lo (2012), the events in August 2007 were just a warm-up act for the main event that occurred in September 2008 when Lehman failed, triggering a much more severe run on repo in this aftermath.

[6] For the open outcry trading hours for each asset, look at Section 2.

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