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The Effect of Macro News on Volatility and Jumps

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This paper investigates the impact of the major US macroeconomic announcements on volatility and jumps of US financial markets. Results indicate significant volatility spillover effects on the following financial markets: exchange traded funds, exchange rates, equity index futures, Treasury bonds futures, volatility indices and equity spot indices. The expected component of changes of macro variables insignificantly affect volatility. The corresponding surprise component positively and significantly affect volatility. The exchange rate market is mostly affected by macro announcements. Moreover, news related jumps are higher in magnitude than non-news-related jumps. Most of the announcements cause significant increases in jump size.

Key Words: Macroeconomic announcements; Volatility; Jumps; Financial markets.
JEL Classification Numbers: G14, C22, G13.

1. INTRODUCTION

Macroeconomic announcements can be considered as a market anomaly. According to the efficient market hypothesis, any non-expected information should not significantly affect a market. The impact of news surprises at intraday intervals was examined by Adams et al. (2004) and Andesren et al. (2007), among others. The impact of macroeconomic announcements on price reactions in the stock market is significant; see Birz and Lott (2011), among others. 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. Boudt and Petitjean (2014) provided a descriptive analysis of spreads and trading volume around jumps. They mainly resarched the impact of news on the liquidity dynamics around jumps, the contribution of liquidity shocks to jumps and contribution of liquidity shocks to prices.

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A recent trend in announcements literature is to examine the effect of macro announcements and surprises on volatility and jumps. Bauwens, Omrane and Giot (2005) studied the impact of nine categories of scheduled and unscheduled news announcements on the euro/dollar return GARCH volatility. News announcements magnify asymmetric volatility and correlations which tend to be high when volatilities are high (Thomakos, Wang, Wu and Chuderewicz, 2008). The announcement effect of the federal funds target rate was studied in an intraday frequency on individual stock returns, volatilities and correlations (Chulia et al., 2010). Volatility (either implied or realized) tends to decline in the hours following central bank interventions (Neely, 2011). Dimpfl (2011) researched the reaction of the German market to the US news announcements. It is also found significantly higher volatility on news days. Recently, using daily data from the Federal funds futures market, Marfatia (2014) estimated the response of S&P 500 stock returns to monetary policy surprises within the time varying parameter (TVP) model.

We extend this literature by documenting the impact of macroeconomic news announcements on volatility and jumps in an intraday frequency across many US financial markets over a decade. The effects of macroeconomic announcement surprises in most of realized volatilities are significant and negative. The expected component of announcement positively and significantly affect volatility series. The unexpected (surprise) component highly, positively and significantly affect volatility series.

Very few papers extensively examined macroeconomic announcements upon intraday jumps. Evidence of significant effect of macroeconomic news on intraday price jumps is provided by Evans (2011). More recently, Chatrath, Miao, Ramchander and Villupuram (2014) investigated the impact of US macro news on currency jumps and cojumps.

For all 8:30 and 10:00 announcements, the volatility-jump frequency of occurence after is higher than the volatility-jump frequency of occurence before each announcement. The number of occurences of jumps which coincide with all macro announcements is less than the total number of jumps, meaning that not all jumps can be explained by announcements releases. Market momentums and/or liquidity may drive intraday jumps. Wang and Huang (2012) found that the continuous component of daily volatility of Hu-Shen 300 index is positively correlated with trading volume, and the jump component reveals a significant and robust negative relation with volume. Jumps tend to cluster around announcement times on announcement days, for the majority of financial assets. The result that there are more positive than negative jumps, is a first indication of some asymmetry in reactions to news. For most of financial assets/markets and announcements, the contribution of the announcement of news to the average absolute size of intraday jumps is statistically significant and negative, across assets and 8:30 as well as 10:00 macro announcements. The impacts of standardized news releases (announcement surprises) to intraday jumps are negative for most of 8:30 announcements and positive for all 10:00 announcements, across financial assets/markets. The impact (magnitude of the coefficient) of news-related jumps is higher than the impact of non-news-related jumps on realized volatility series. All impacts are significant. Across all results, there are not significant differences either in significance or in magnitude between 8:30 and 10:00 announcements. Furthermore, the foreign exchange market is the market with the most significant news-releases effect on volatility and jumps. This is consistent across the board of effect's measurements as well as the various exchange rates within this market.

The outline of this paper is as follows. Section 2 describes the volatility estimation and the jump detection scheme. Section 3 describes the data used. Section 4 provides the results and Section 6 offers concluding remarks.

2. THEORETICAL FRAMEWORK

2.1. Volatility estimation

The equilibrium price evolves as a function of a stochastic volatility process as:

$$p^*_{t_i} = \int_0^{t_i} \sigma_s dW_s + j_{t_i} \tag{1}$$

where σ_t is a stochastic volatility process and W_t is standard Brownian motion and where j_{t_i} denotes the component that will appear in the price process in the case there are discrete jumps. The integrated volatility over the whole day is then given by:

$$V_t = \int_0^1 \sigma_s^2 ds + \lambda_t \tag{2}$$

where $\lambda_t = \sum_{0<s\leq 1} \kappa_s^2$ is the contribution of the jumps into the volatility, with $\kappa_s$denoting the size of the discrete jumps.

To present the realized volatility estimator used, consider first the case where $j_{t_i} = q_t = 0$ so that there are no jumps present. Then, a consistent estimator for volatility, as $m \to \infty$, is given by the sum of intraday squared equilibrium returns as:

$$RV_{t*}^{(m)} = \sum_{i=1}^{m} r_{i,m}^{*2} \to V_t \tag{3}$$

However, $r^{*2}_{i,m}$ is latent and thus the above estimator cannot be implemented. The obvious alternative is to use the sum of intraday squared observable returns but this alternative is not robust to the presence of microstructure noise (leading to various inconsistencies). One has therefore to consider various other estimators. Let's begin with the naive benchmark, the realized 5-minute estimator.

The currently accepted realized volatility estimator comes from Andersen, Bollerslev, Diebold and Labys (2001), ABDL hereafter, and is simply the sum of the observable intraday squared returns:

$$RV_t^{(m)} = \sum_{i=1}^{m} r^2_{i,m} \tag{4}$$

In the absence of noise, this estimator is a consistent estimator of V_t as the sampling frequency increases. However, because the existing microstructure noise makes realized volatility estimator being a biased volatility estimator, another realized volatility estimator trying to correct for noise is used. The estimator selected is the two-scale realized volatility estimator (as examined, in Barndorff-Nielsen, Hansen, Lunde, and Shephard, 2008, and 2011, among others); however, the asymptotically optimal number of subsamples is selected as in Bandi and Russell (2008).

At first, suppose the full grid with all observations within the day is defined as G and m is number of observations (the size of G). G is then partitioned into k non-overlapping sub-grids $G^{(k)}$ of size m_k. If a sparse sampling (e.g. every 5 or 15-minutes) approach is used, only one portion of the data set will be used. For example, if the highest sampling frequency is every minute, and 5-minute returns is the selected frequency in constructing a volatility estimator, then the rest four (4) data points within every five minutes that could have been used, are ignored. Therefore, one can use additional information while doing sparse sampling. Defining the sparse sampling over sub-grid i as:

$$RV^{(k)}_{sparse} = \sum_{t_j, t_{j+} \in G^{(k)}}^{m_k} (p_{t_{j+}} - p_{t_j})^2 \tag{5}$$

where $p_{t_{j+}}$ is the next observation within grid k, the subsample average estimator can be defined as the average of all of the possible grids, or sub-samples:

$$RV_t^{(Avg)} = \frac{1}{k} \sum_{i=1}^{k} RV^{(k)}_{sparse} \tag{6}$$

This estimator, however, is still biased at high frequencies.

The first best estimator in Zhang et al. (2005), known as the two time-scales estimator, uses $RV^{(Avg)}$ together with realized volatility calculated at the highest possible frequency possible m, $RV_t^{(m)}$:

$$RV_t^{(TS)} = RV_t^{(Avg)} - \frac{\bar{m}}{m} RV_t^{(m)} \tag{7}$$

where $\bar{m} = (m - k + 1)/k$. The asymptotically optimal number of subsamples, k_{opt} can be chosen as:

$$k_{opt} = \left(\frac{3\widehat{\sigma}_e^4}{\widehat{Q}_t} \right)^{\frac{1}{3}} m^{2/3} \tag{8}$$

where $\widehat{\sigma}_e^2$ and $\widehat{Q}_t$ are estimated as the optimal sampling frequency estimation in the optimally-sampled realized volatility estimator) by Bandi and Russell (2008). The two-scale estimator used here, has its number of subsamples selected (as in Bandi and Russell, 2008) as:

$$k_{opt}^{fs} = \left(1.5 \frac{\left[RV_t^{(m/15)}/m \right]^2}{\widehat{Q}_t} \right)^{1/3} m \tag{9}$$

and the resulting estimator is denoted by $RV_t^{(TS,fs)}$.

2.2. Jump detection

Barndorff-Nielsen and Shephard (2004, 2006 and 2007) are early references on testing for jumps in the context of high-frequency intraday data and realized volatility estimators. The main idea is based on the use of thte difference between realized volatility (as an estimator of the integrated variance of the price process including any jumps) and bi-power variation (the estimator of the integrated variance excluding the jumps λ_t). The estimator for bi-power variation is given by:

$$BPV_t^{(m)} = \mu_p^{-2} \sum_{i=2}^{m} |r_{i,m}| \, |r_{i-1,m}| \tag{10}$$

where $\mu_p = \mathsf{E}\left(|Z|^p\right)$ is the mean of the pth absolute moment of a standard normal distribution. Under certain conditions we have that, as $m \to \infty$, the bi-power variation estimator converges to $V_t - \lambda_t$ and therefore we have that, in general, $RV_t^{(j)} - BPV_t^{(m)} \to \lambda_t$, the jump component of volatility; here $RV_t^{(j)}$denotes any of the estimators defined in the previous section.

Identifying significant jumps thus requires a test statistic with at least three components: an estimator of volatility that includes jumps, an estimator of volatility that excludes jumps, and estimators of various other moments that make the asymptotic distribution of the test statistic tractable and operational. In the version of the test proposed by Huang and Tauchen (2005), the test statistic is given by (the log-based version of their test is used[1]):

$$Z_t^{(j)} = m^{1/2} \frac{\log\left(RV_t^{(j)}/BPV_t^{(m)}\right)}{\left[\left(\mu_1^{-4} + 2\mu_1^{-2} - 5\right)\left\{TPQ_t\left(BPV_t^{(m)}\right)^{-2}\right\}\right]^{1/2}} \tag{11}$$

with the statistic having a standard normal sampling distribution as $m \to \infty$.

A jump is deemed to be significant if the test statistic exceeds the appropriate critical value of the standard normal distribution, denoted by Φ_α, at α level of significance. Although a jump can be defined without reference to the test statistic, as $\tilde{J}_t^{(j)} = \max\left(RV_t^{(j)} - BPV_t^{(m)}, 0\right)$, the following test-based version is used for defining a day with a significant jump:

$$J_t^{(j)} = I\left(Z_t^{(j)} > \Phi_\alpha\right)\left(RV_t^{(j)} - BPV_t^{(m)}\right) \tag{12}$$

with the continuous component of volatility defined naturally as $C_t^{(j)} = RV_t^{(j)} - J_t^{(j)}$. Here, $J_t^{(j)}$ is the sample estimator of the theoretical jump component λ_t in the sense that $J_t^{(j)} \to \lambda_t$. In addition to the $J_t^{(j)}$ jump component, the subset of significant jumps, namely $J_t^{+(j)} = \left\{J_t^{(j)} | J_t^{(j)} > 0\right\}$ and also in the binary series $B_t^{(j)} = I\left(J_t^{(j)} \neq 0\right)$ of jump occurrences can be retrieved.

3. DATA

The impact of US macro announcements is evaluated in the following financial markets: exchange traded funds (DIA, IWM, MDY, QQQ, and SPY) (ETF market), foreign exchange rates (USD/CAD, USD/JPY, GBP/USD, EUR/USD, AUD/USD) (FX market), equity index futures ($S\&P-500$ with the acronym ES) (EFI market), U.S. Treasury bonds futures contract (with the acronym US) (BF market), volatility index

[1]Results are similar using the ratio-based version of the same statistic. See Huang and Tauchen (2005) and ABD (2007) for details.

(CBOE Volatility Index with the acronym VIX) (VOL market), and equity spot market (Nasdaq Composite, Dow Jones Industrial Average, S&P 500, and Russell 2000 indices with the acronyms $COMPX$, $INDU$, INX, and RUT, respectively) (ESI market). Data observations are sampled at a 1-minute frequency. The related literature attempts to prove consistency of results by a long span of high frequency time series data (LLN, 2011, Evans, 2011, and Rosa, 2011).

Week-ends and a set of fixed and irregular holidays, as well as the days with too many missing values are removed. Data series are collected from and up to different time across this paper financial assets. In specific, for ETFs in this paper, the trading day starts at 9:31 and ends at 16:15[2]. For equity spot indices and volatility index as well, the trading day starts at 10:01 and ends at 16:00[3]. For futures indices, the trading day starts at 10:01 and ends at 16:15[4]. For foreign exchange series, the trading day starts at 0:01 and ends at 23:59 (all day long). So, where the 8:30 announcements are examined, only the two futures (ES, and US) and the five exchange rates (USD/CAD, USD/JPY, GBP/USD, EUR/USD, AUD/USD) are used. For the 10:00 announcements, all time series data are used. Sample includes data from January 2001 to November 2011[5].

Announcements data come from the Bureau of Economic Analysis and the US Census Bureau of the US Department of Commerce, the Bureau of Labor Statistics of the US Department of Labor, and the Board of governors of the Federal Reserve System. Announcements are classified into two categories based on the time of each announcement: six announcements at 8:30 am, and four at 10:00 am. Table 1 analytically lists the announcements with the corresponding time. In total, there are 1,199 announcements during the sample period; in detail, there are 771 announcements in the 8:30 am category and 428 in the 10:00 am category. The pre-announcement period selected is 5 minutes, and the post-announcement is 25 minutes. These selections are the empirically appropriate ones for the 1-min returns series used. They are also consistent with the recent literature on macroeconomic announcements. Elder et al. (2012) selected 5 minutes as both the pre- and post-aanouncement period in a tick-by-tick data sampling frequency. He examines the impact of US macroeconomic news announcements on return, volatility and volume for three commodi-

[2]All ETFs (DIA, IWM, MDY, QQQ, and SPY) used in this paper track the $INDU$, RUT, S&$P-400$, $NASDAQ-100$ and INX equity spot indices, respectively. That is why, data start at 9:31 and end at 16:15. Similar time span regarding ETFs has been used by Rosa (2011) as well.

[3]Trading hours for these indices are the regular trading hours, from 9:30 up to 16:00 EST (Eastern Standard Time); also, selected by Rosa (2011).

[4]Trading hours for these two futures contracts are from 8:20 up to 16:15 EST (Eastern Standard Time); also, selected by Evans (2011).

[5]However, exchange rates start from October 2003.

TABLE 1.

List of US macroeconomic news announcements.

Time	Announcement (abbreviation)	*obs*
8:30	Trade Balance Goods & Services (TB)	127
8:30	Gross Domestic Product (GDP)	131
8:30	Personal Income (PI)	126
8:30	Producer Price Index (PPI)	128
8:30	Consumer Price Index (CPI)	129
8:30	Employment Situation Index (EM)	130
10:00	Construction Spending (CS)	80
10:00	US Import & Export Price Indexes (ES)	131
10:00	FED Funds Target Rate (TR)	88
10:00	Real Earnings (RE)	129
	Total	1199

Notes. Table 1 lists the 10 different types of macroeconomic announcements, the time of their release, the number of observations, and the relative standard deviation (sv/μ) of the differences between actual and forecast (surprises). For Construction Spending only, there is data available from 2005.

ties futures. Evans and Speight (2010) analyzes the volatility dynamics surrounding announcements by using 15 minutes as the pre-anouncement period and either 5 minutes or 25 minutes as the post-announcement one at a 5-min data sampling frequency. Rosa (2011) investigates the effects of Federal Reserve's decisions on equity indices, where the pre-announcement period is 10 minutes and the post-announcement period is 20 minutes, in a 5-min data samlping frequency.[6] In terms of jumps detection, the selection of the pre- and post-announcement period does not affect the frequency of occurrence of jumps. This holds because the jump detection scheme tries to detect the existence of one and only significant jump in the volatility series (either in the pre- or post-announcement period). So, the difference between 5 and 25 minutes does not affect the expectation of less or more jumps detected.

4. EMPIRICAL RESULTS

All regressions in the present section produce significant estimates of coefficients. Significance is answered in a 5% significance level and Newey and West (1987) HAC standard errors are employed. However, the values of coefficients for all regressions are low in magnitude. That is why the

[6]However, it was depicted that the equity indices tend to incorporate FOMC monetary surprises within 40 minutes after the announcement.

coefficients are scaled in order to make them close in scale to one. In specific, all coefficients are multiplied with 10^5. Scaling concerns Tables 2A, 2B, 3A, 3B, 5A, 5B, 6A and 6B.

4.1. Response of volatility to macroeconomic announcements

This section complements literature on the response of US macroeconomic announcements on volatility. Recent relative studies are Andersen, Bollerslev, Diebold, and Vega (2007), Chulia et al. (2010) and Gospodinov and Jamali (2012).

In the present paper, event study regressions are employed for evaluating the effect of US macroeconomic announcements on volatility as in Gospodinov and Jamali (2012). Equation (13) concerns regressing the change of realized volatility (DRV_t) on the standardized surpises ($SA_{j,t}$) of the macroeconomic announcements:

$$DRV_t = \alpha + \beta_j \cdot SA_{j,t} + \epsilon_t \tag{13}$$

where $SA_{j,t}$ is the announcement surprise for announcement j, $DRV_t = RV_t - RV_{t-1}$ is the change in the level of volatility between the day of the announcement and the previous day. The announcement surprise is a standardized measure:

$$SA_{j,t} = \frac{A_{j,t} - E_{j,t}}{\sigma_{j,t}} \tag{14}$$

where $A_{j,t}$ is the actual macroeconomic variable, $E_{j,t}$ is the expected (forecasted) macroeconomic variable (last period actual value) and $\sigma_{j,t}$ is the standard deviation of the $A_{j,t} - E_{j,t}$ difference. The change of the macroeconomic variable from the news release is decomposed into an expected and a surprise component. The effect of each component on realized volatility is studied via the following regression:

$$DRV_t = \alpha + \beta_j^e \cdot Di_{j,t}^e + \beta_j^u \cdot Di_{j,t}^u + \epsilon_t \tag{15}$$

where $Di_{j,t}^u$ is the unexpected component (or announcement surprise, $SA_{j,t}$), $Di_{j,t}^e$ is the expected component which equals to the difference between the actual value of the macroeconomic variable and the unexpected component ($Di_{j,t} - Di_{j,t}^u$).

It is common in literature to use first differences in volatility[7]. Moreover, Newey and West's (1987) heteroskedasticity and autocorrelation consistent (HAC) standard errors are used to ensure valid inference. The β_j coefficient estimates the effect β_j of macroeconomic surprises on realized volatility. The meaning of this coefficient is that a unit percentage change in the

[7] See, Nikkinen and Sahlstrom (2004).

TABLE 2A.

Effect (β_j) of 8:30 announcements on volatilities.

	TB	GDP	PI	PPI	CPI	EM	All 8:30	All 8:30 & 10:00
$EURUSD$	−0.152*	0.049	0.018	0.080*	0.081	−0.093	0.053*	0.033*
$AUDUSD$	−0.017	0.123*	−7.056e-3	0.132*	−0.019*	−0.164	0.041*	0.048*
$USDCAD$	−0.125	0.087*	0.016	0.023	−7.311e-3*	−0.153	0.024*	2.596e-3
$GBPUSD$	−0.020*	1.208e-4	−0.027	0.012	0.045	−0.298*	0.266*	21.420
$USDJPY$	−7.205e-3*	0.014	−0.057	0.066	0.060	−0.059	−0.160*	−0.050*
ES	0.023	0.115*	−0.153*	0.105*	0.253	0.277	−0.037*	0.044*
US	−0.032*	−0.112	−0.124	0.038	−0.042	0.292	0.476*	0.047*

Notes. Table 2A presents β_j coefficient from estimating Eq. (13) for 8:30 announcements. The symbol * indicates significance in a 5% significance level.

TABLE 2B.

Effect (β_j) of 10:00 announcements on volatilities.

	CS	ES	TR	RE	All 10:00
$EURUSD$	0.012	−0.027*	0.258	−0.042*	−1.724e-3
$AUDUSD$	0.076*	−0.070*	3.191	3.795e-4	0.232*
$USDCAD$	−0.053*	−5.575e-4	0.768*	−7.677e-4	5.636e-4
$GBPUSD$	0.013*	−0.032	−0.190*	−0.023	0.039*
$USDJPY$	−0.124*	−0.029	0.763*	0.077*	0.074
ES	0.181*	0.304	−24.240	0.113*	−0.634*
US	0.053	−0.027*	−5.495	0.071	−0.041*
SPY	−0.178*	0.242*	−25.578	0.093	−0.294*
QQQ	0.434	0.157*	−25.826	0.068	−0.179*
MDY	−0.261*	6.000e-3	−26.443	0.258*	−0.183*
IWM	0.286	−0.157*	−36.072	0.401*	−0.223*
DIA	−0.078*	0.368	−21.900	0.051	−0.262*
VIX	−9.080	1.768	−296.477	20.827	−1.241
RUT	−0.209*	−3.488	9.027	0.359*	−5.942e-3
INX	0.285	0.258*	−23.401	0.063*	0.573*
$INDU$	0.055*	0.321*	−21.615	−0.012	−0.510
$COMPX$	0.104*	2.143	−16.428	0.155*	−0.166*

Notes. Table 2B presents β coefficient from estimating Eq. (13) for 10:00 announcements. The symbol * indicates significance in a 5% significance level.

announcement surprise ($SA_{j,t}$) tends to increase or decrease the change in realized volatility by β_j percentage points. Analytical results are presented in Tables 2A and 2B. According to Table 2A, the highest (lowest) 8:30 announcement effect on volatility series is for US ($GBPUSD$) asset and EM (EM) announcements. Across all 8:30 & 10:00 announcements and in average, the highest (lowest) all-8:30-&-10:00 announcement effect on volatility series is for $GBPUSD$ ($USDJPY$) asset. According to Table 2B, the highest (lowest) 10:00 announcement effect on volatility series is for VIX (VIX) asset and RE (TR) announcement. The effects in most of volatilities are negative.

TABLE 3A.

Effect of the expected (β^e) and unexpected (β^u) components of 8:30 announcements on volatilities.

	TB	GDP	PI	PPI	CPI	EM	All 8:30	All 8:30 & 10:00
	Panel A. Expected (β^e) components							
$EURUSD$	0.206	0.116*	7.122	0.094	0.063	−0.472*	4.576e-3	0.040*
$AUDUSD$	0.106*	0.040	15.066	0.125	−0.011*	−0.875	−0.019	0.052
$USDCAD$	0.615	0.184	9.908	−0.031	−0.027	−0.444*	0.020*	−6.085e-3
$GBPUSD$	−0.297*	−0.012	19.788	−0.026*	0.048*	−0.163	−7.909e-3*	194.230
$USDJPY$	0.071*	−0.159	5.644	0.057*	0.064*	−0.491	−0.124*	−0.051*
ES	−0.513	0.068*	1.147	−0.504	0.679*	0.117	−0.053*	0.040
US	−2.303	0.957	8.474	−0.080*	−0.064	−1.837	0.415	0.048*
	Panel B. Unexpected (β^u) components							
$EURUSD$	−0.117*	0.067	−0.055	−0.028*	−0.158*	−0.374	8.692e-3	−5.974e-3
$AUDUSD$	−0.040*	0.027	−0.117*	0.016	0.072*	−0.702	0.011*	−2.712e-3
$USDCAD$	−0.244*	0.097	−0.077	0.110	−0.171*	−0.286*	6.581e-4	6.935e-3
$GBPUSD$	0.091	−0.012*	−0.154*	0.079	0.020	0.133*	6.093e-3	11.111
$USDJPY$	−0.026*	−0.174*	−0.044*	0.018*	0.034	−0.426*	−6.406e-3*	2.058e-4
ES	0.177	−0.047*	−0.010*	1.247	3.637	−0.157*	3.777e-3	5.668e-3
US	0.752	1.068	−0.067*	0.242	−0.184*	−2.097	0.015	−1.355e-3*

Notes. Table 3A presents the effects of the expected (β^e coefficient) in Panel A and unexpected (β^u coefficient) in Panel B components of 8:30 macroeconomic announcements on volatilities. The symbol * indicates significance in a 5% significance level.

Tables 3A and 3B report the announcement effect on volatility series, when the announcement variable change is decomposed into an expected and an unexpected component. Overall, the expected component insignificantly affect volatility series. The unexpected (surprise) component highly, positively and significantly affect volatility as well for all 8:30 announcements. The result that the expected component insignificantly affect and surprise component highly, negatively and significantly affect volatility, is consistent with the market efficiency hypothesis, where only new information arrivals lead to a response of financial variables. [8]

According to Table 3A, the highest (lowest) 8:30 announcement expected effect on volatility series is for $USDCAD$ (US) asset and PI (TB) announcement. Across all 8:30 & 10:00 announcements and in average, the

[8]Based on surprises of the Federal funds rate, Bernanke, and Kuttner (2005) provided evidence that stock returns and volatility only respond to the Federal funds rate surprise component but not to the expected component.

TABLE 3B.

Effect of the expected (β^e) and unexpected (β^u) components of 10:00 announcements on volatilities.

	CS	ES	TR	RE	All 10:00
$EURUSD$	−3.811 (0.243)	0.084* (0.112*)	0.330 (−2.774e-3)	−0.187* (−0.146)	−9.573e-3* (5.383e-3*)
$AUDUSD$	−4.930 (0.318)	−0.029* (0.042*)	2.567 (0.024*)	−0.464 (−0.467)	0.215 (0.012*)
$USDCAD$	−4.290 (0.270*)	0.023 (0.024)	3.751 (−0.115)	−0.067 (−0.059*)	−2.648e-3 (5.681e-3*)
$GBPUSD$	−1.441 (0.092)	−0.105* (−0.074)	0.057* (−9.538e-3)	−0.153 (−0.131*)	0.038* (1.019e-3*)
$USDJPY$	−4.856 (0.301*)	−0.131 (−0.103)	0.244 (0.020*)	−0.127 (−0.205)	0.061 (9.014e-3*)
ES	−15.207 (0.979*)	0.731* (0.431*)	−15.555 (−0.335)	−1.379 (−1.498)	−0.596* (−0.033)
US	−3.134 (0.203*)	0.038 (0.065*)	−6.207 (0.028*)	−0.391* (−0.464*)	−0.032 (−7.840e-3)
SPY	−17.915 (1.128)	0.602* (0.365*)	−18.520 (−0.273)	−0.980 (−1.078)	−0.458* (0.141*)
QQQ	−14.419 (0.945)	0.681 (0.530*)	−22.182 (−0.141)	−1.075 (−1.148)	−0.258 (0.068*)
MDY	−7.992 (0.492*)	0.476* (0.474*)	−18.089 (−0.322*)	−1.996 (−2.263)	−0.216* (0.028*)
IWM	−24.674 (1.587)	0.451 (0.613*)	−19.955 (−0.622)	−1.629 (−2.038)	−0.362 (0.120*)
DIA	−19.059 (1.208)	0.780* (0.417*)	−17.986 (−0.151*)	−0.804* (−0.859)	−4.928e-3 (−0.168)
VIX	−17.628 (1.149)	−7.809 (−9.695)	−221.145 (−2.908)	−19.739 (−40.630)	−5.324 (2.678)
RUT	−5.367 (0.328*)	−3.625 (−0.139)	17.318 (−0.320*)	−0.479 (−0.841)	−0.046 (0.034*)
INX	−7.874 (0.519*)	0.734* (0.481*)	−15.210 (−0.316)	−0.779* (−0.846)	0.516* (0.048*)
$INDU$	−14.887 (0.951)	−0.696 (0.379*)	−18.149* (−0.134)	−0.728 (−0.720)	−0.492* (−0.016*)
$COMPX$	−9.860 (0.634*)	2.345 (0.204*)	−13.122* (−0.127)	−0.636 (−0.795)	−0.229* (0.054*)

Notes. Table 3B presents the effects of the expected (β^e coefficient) and unexpected (β^u coefficient) components of 10:00 macroeconomic announcements on volatilities. The latter coefficients are included in parentheses. The symbol * indicates significance in a 5% significance level.

highest (lowest) all-8:30-&-10:00 announcement effect on volatility series is for $GBPUSD$ ($USDJPY$) asset. Morever, the highest (lowest) 8:30 announcement unexpected (surprise) effect on volatility series is for VIX (VIX) asset and $All - 10:00$ (RE) announcement. Across all 8:30 & 10:00 announcements and in average, the highest (lowest) all-8:30-&-10:00 announcement unexpected (surprise) effect on volatility series is for $GBPUSD$ ($USDJPY$) asset.

According to Table 3B, for the 10:00 announcements, the highest (lowest) 10:00 announcement expected effect on volatility series is for RUT (VIX) asset and TR (TR) announcement. Morever, the highest (lowest) 10:00 announcement unexpected (surprise) effect on volatility series is for VIX (VIX) asset and CS (RE) announcement.

4.2. Volatility jumps and their responses to macroeconomic announcements

This subsection investigates the impact of macroeconomic news announcements on intraday jumps. Analysis is employed similarly to Evans (2011). Seperating intraday jumps into two sub-samples of news-related jumps and non-news-related jumps reveals initial differences between these two jump series. Tests of equality of means show that news-related jumps are not significantly different from non-news-related jumps. An explanation may be that positive and negative jumps are likely to offset each other. However, for the absolute values of jumps, news-related jumps are significantly larger in average than non-news-related jumps. Seperating positive and negative jumps also reveals important differences between the two groups with average positive (negative) news-related jumps significantly larger (smaller) than average positive (negative) non-news-related jumps.

TABLE 4A.

Changes (ΔJF_j) of jump frequencies between the after (8:30-8:55) and the before (8:25-8:30) period for each 8:30 announcement.

	TB	GDP	PI	PPI	CPI	EM	All 8:30
EURUSD	22% (8%)	29% (10%)	16% (9%)	21% (9%)	14% (9%)	9% (9%)	19% (5%)
AUDUSD	30% (8%)	27% (10%)	77% (9%)	22% (9%)	21% (9%)	20% (9%)	21% (7%)
USDCAD	20% (9%)	24% (9%)	15% (8%)	21% (9%)	21% (9%)	8% (7%)	17% (4%)
GBPUSD	11% (7%)	17% (8%)	23% (9%)	22% (9%)	24% (9%)	11% (8%)	26% (6%)
USDJPY	20% (8%)	23% (10%)	16% (8%)	21% (9%)	18% (9%)	8% (8%)	19% (5%)
ES	54% (4%)	53% (3%)	60% (4%)	47% (3%)	54% (3%)	25% (2%)	51% (2%)
US	61% (4%)	72% (4%)	69% (5%)	61% (3%)	64% (5%)	32% (8%)	62% (0%)

Notes. Table 4A presents the changes (ΔJF_j) of the volatility-jump frequencies after and jump frequencies before each 8:30 announcement. Values out of brackets concern number of days with jumps ($J^1_{j,t}$) as a percentage of the total sample of days with announcements; values in brackets concern number of days with jumps ($J^2_{j,t}$) as a percentage of the total sample of days with or without announcements. *Before* is the time period 5-min before each announcement. *After* is the time period 25-min after each announcement. Sample is the days with jumps, as those are more than the ones with announcements. For the rest of the abbreviations, see Table 1.

Tables 4A and 4B report the changes (ΔJF_j) of the volatility-jump frequencies after and jump frequencies before each 8:30 (Table 4A) or 10:00 (Table 4B) announcement for all financial assets. $J^1_{j,t}$ is the number of days with jumps (as a percentage of the total sample of days with announcements) more (or less) in the after period than those in the before period, and $J^2_{j,t}$ is the number of days with jumps (as a percentage of the total sample of days with or without announcements) more (or less) in the after period than those in the before period. After is the time period 25-minutes after each announcement. Before is the time period 5-minutes from 5-min before each announcement. As far as all changes are positive, the number of jumps after announcements is higher than before. The number of jumps in each market is less than the total number of news announcements (lower than 100%) meaning that announcements are not the only factor causing jumps. The number of occurences of jumps which coincide with all macro announcements is less than the total number of jumps, meaning that not all jumps can be explained by announcements releases. Results are similar

TABLE 4B.

Changes (ΔJF_j) of jump frequencies between the after (10:00-10:25) and before (9:55-10:00) period for each 10:00 announcement.

	CS	ES	TR	RE	All 10:00	All 8:30 & 10:00
$EURUSD$	14% (11%)	12% (13%)	23% (15%)	10% (8%)	14% (15%)	15% (6%)
$AUDUSD$	23% (12%)	19% (15%)	36% (17%)	19% (11%)	23% (12%)	18% (8%)
$USDCAD$	16% (15%)	17% (12%)	15% (16%)	15% (12%)	16% (13%)	11% (6%)
$GBPUSD$	14% (11%)	10% (10%)	2% (15%)	12% (10%)	12% (15%)	11% (5%)
$USDJPY$	10% (13%)	16% (10%)	20% (14%)	5% (7%)	14% (16%)	12% (5%)
ES	25% (12%)	25% (11%)	29% (15%)	28% (11%)	26% (15%)	36% (18%)
US	58% (13%)	62% (13%)	56% (15%)	48% (10%)	58% (9%)	53% (17%)
SPY	13% (11%)	13% (11%)	23% (15%)	6% (12%)	12% (9%)	-
QQQ	32% (12%)	25% (13%)	30% (17%)	20% (11%)	24% (10%)	-
MDY	23% (12%)	12% (10%)	18% (15%)	15% (10%)	16% (12%)	-
IWM	16% (15%)	17% (14%)	20% (20%)	10% (13%)	20% (9%)	-
DIA	18% (13%)	13% (11%)	12% (15%)	13% (10%)	13% (10%)	-
VIX	42% (15%)	46% (12%)	40% (18%)	35% (12%)	30% (6%)	-
RUT	6% (15%)	7% (13%)	5% (17%)	5% (11%)	7% (10%)	-
INX	5% (13%)	4% (11%)	10% (17%)	6% (10%)	9% (11%)	-
$INDU$	4% (13%)	8% (13%)	7% (19%)	8% (8%)	8% (10%)	-
$COMPX$	5% (14%)	3% (13%)	6% (17%)	3% (8%)	6% (10%)	-

Notes. Table 4B presents changes (ΔJF_j) of the volatility-jump frequencies after and jump frequencies before each 10:00 announcement. Values out of brackets concern number of days with jumps ($J^1_{j,t}$) as a percentage of the total sample of days with announcements; values in brackets concern number of days with jumps ($J^2_{j,t}$) as a percentage of the total sample of days with or without announcements. *Before* is the time period 5-min before each announcement. *After* is the time period 25-min after each announcement. Sample is the days with jumps, as those are more than the ones with announcements. For the rest of the abbreviations, see Table 1.

TABLE 5A.

Contribution γ_j of the 8:30 announcements to the absolute size of intraday jumps.

	TB	GDP	PI	PPI	CPI	EM	All 8:30
$EURUSD$	−0.115*	−0.057*	−0.023*	−0.042	−0.060*	−0.578*	−0.108*
$AUDUSD$	−0.022*	−0.094*	−0.034*	0.016*	−0.048*	−0.038*	−0.064*
$USDCAD$	−0.082*	−0.071*	−0.033*	0.031*	−0.017*	3.008e-4	3.418e-3
$GBPUSD$	−0.066*	−0.025*	−9.617e-3	5.287e-4	−0.046*	−0.079*	−0.042*
$USDJPY$	−0.020*	−0.054*	−0.036*	−0.045*	4.278e-3	−0.674*	0.082
ES	−0.018*	−0.284*	9.615e-3*	0.191*	0.467*	−0.438*	−0.033*
US	0.499*	0.281	−0.080*	−0.242*	0.083*	−1.495*	0.913*

Notes. Table 5A reports the contribution of the announcement of news to the average absolute size of intraday volatility-jumps.

$$|J_{j,t}| = a_j + \gamma_j \cdot D_{j,t} + \epsilon_{j,t} \tag{16}$$

where $|J_{j,t}|$ is the absolute jump size in time t for the j announcement and $D_{j,t}$ is a dummy variable that takes the value of 1 if there is an announcement at that day. Sample is the days with jumps, as those are more than the one with announcements. For the other abbreviations in the Table, see Table 1. The symbol * indicates significance in a 5% significance level.

to those of LLN (2011). Jumps tend to cluster around announcement times on announcement days, for the majority of financial assetes. This means there are more frequent jumps on announcement days and no evidence for larger jump sizes on announcement days. The result that there are more positive than negative jumps, is a first indication of some asymmetry in reactions to news. The highest (lowest) volatility-jump frequencies upon days with announcements ($J^1_{j,t}$) come from the US (ES) asset and the GDP (EM) announcement across the 8:30 announcements, and from the US ($COMPX$) asset and the ES (ES) announcement across the 10:00 announcements.[9] The highest (lowest) volatility-jump frequencies upon all sample days ($J^2_{j,t}$) come from the $USDJPY$ (ES) asset and the GDP (EM) announcement across the 8:30 announcements, and from the $INDU$ ($USDJPY$) asset and the TR (RE) announcement across the 10:00 announcements. The null of equality of means of jumps on non-announcement and announcement days is rejected in most of financial assets. So, there is a significance difference of the jump magnitudes between before and after the announcements.[10] This result is in accordance to LLN (2011).

Next, is analyzed the contribution of the announcement of news to the average absolute size of intraday jumps.

$$|J_{j,t}| = a_j + \gamma_j \cdot D_{j,t} + \epsilon_{j,t} \tag{18}$$

[9] According to LLN (2011), non-dollar exchange rates respond less to US announcements than dollar exchange rates. The stock index futures markets are not open during times of announcements. Moreover, unemployment and Trade balance are the news releases with the highest association with jumps.

[10] Analytical results are available upon request.

TABLE 5B.

Contribution γ_j of the 10:00 announcements to the absolute size of intraday volatility-jumps.

	CS	ES	TR	RE	All 10:00	All 8:30 & 10:00
$EURUSD$	0.258*	0.017*	0.257*	−0.037	−7.379e-3*	0.025*
$AUDUSD$	4.561e-3*	−0.065*	0.389*	−0.065*	−0.019*	0.092*
$USDCAD$	5.143e-3*	−0.024*	−0.032*	−0.050*	−0.011*	−4.783e-3
$GBPUSD$	0.086*	9.915e-3	0.015*	−0.021*	−0.012*	53.258
$USDJPY$	−0.078*	−0.020*	−6.055e-3	−0.050*	−0.010*	−0.036*
ES	0.303*	−0.029*	−0.140*	−0.245*	−0.045*	−4.836e-3*
US	0.156*	−0.011*	−0.031*	−0.041*	0.016*	0.177*
SPY	0.173*	−0.058*	−0.114*	−0.244*	−0.020*	-
QQQ	0.345*	0.434*	−0.161*	−0.117*	0.184*	-
MDY	−0.215*	0.048*	−0.170*	−0.324*	−0.139*	-
IWM	0.494*	−0.186*	−0.297*	−0.328*	0.064	-
DIA	0.312*	0.053*	−0.143*	−0.227*	−0.035*	-
VIX	5.011	−7.069	−19.199	−9.197	−8.730	-
RUT	−0.192*	−0.092*	−0.113*	−0.164*	−0.016*	-
INX	0.117*	−0.077*	−0.203*	−0.118*	0.035*	-
$INDU$	0.202*	−0.102*	−0.153*	−0.168*	−0.083*	-
$COMPX$	0.210*	−0.025	−0.127*	−0.094*	0.027*	-

Notes. Table 5B reports the contribution of the announcement of news to the average absolute size of intraday volatility-jumps.

$$|J_{j,t}| = a_j + \gamma_j \cdot D_{j,t} + \epsilon_{j,t} \tag{17}$$

where $|J_{j,t}|$ is the absolute jump size in time t for the j announcement and $D_{j,t}$ is a dummy variable that takes the value of 1 if there is an announcement at that day; sample is the days with jumps. The symbol * indicates significance in a 5% significance level.
For the other abbreviations in the Table, see Table 1.

where $|J_{j,t}|$ is the absolute jump size in time t for the j announcement and $D_{j,t}$ is a dummy variable that takes the value of 1 if there is an announcement at that day; sample is the days with jumps. Results are depicted in Tables 5A and 5B. The highest (lowest) contribution of the announcement of news to the average absolute size of intraday jumps (γ_j) come from the US (US) asset and the TB (EM) announcement across the 8:30 announcements, and from the VIX (VIX) asset and the ES (TR) announcement across the 10:00 announcements. For most of financial markets and announcements, the γ_j coefficient is statistically significant and negative, across assets and 8:30 as well as 10:00 macro announcements.[11] This reveals that the arrival of macroeconomic news releases decreases the absolute size of intraday jumps. This is true for all news combined (All-8:30, All-10:00 as well as All-8:30-&-10:00 announcements' categories) as

[11]Few exceptions are present.

well. There are not significant in-magnitude differences either between 8:30 and 10:00 announcements or between the financial markets.

TABLE 6A.

Impact (δ_j) of 8:30 macroeconomic standardized news releases to intraday volatility-jumps.

	TB	GDP	PI	PPI	CPI	EM	All 8:30
EURUSD	−0.011*	2.667e-3	3.652e-3	−8.970e-3	−3.532e-3*	0.375*	−0.162*
AUDUSD	−0.033*	2.627e-3	−6.322e-4*	0.023*	−0.051*	0.107*	−0.035*
USDCAD	−0.036*	0.010*	2.746e-3	−8.811e-4*	−1.756e-3	0.042*	−9.689e-3
GBPUSD	−4.823e-3	5.138e-3*	−4.115e-3*	−0.019*	4.124e-3	0.038*	−0.064*
USDJPY	−1.109e-4	5.298e-3*	−5.021e-3	0.028*	0.015*	0.105*	−0.017*
ES	−2.592e-3*	0.016	−0.030*	−0.054*	−5.116e-3	0.056*	0.109*
US	−1.676e-3	0.018*	7.757e-3*	0.026	−0.032	−0.296*	−0.094*

Notes. Table 6A reports the impact of 8:30 macroeconomic standardized news releases to intraday volatility-jumps. The standardized news is depicted as

$$SA_{j,t} = \frac{A_{j,t} - E_{j,t}}{sv_{j,t}} \tag{19}$$

where $A_{j,t}$ is the actual macroeconomic variable, $E_{j,t}$ is the expected (forecasted) macroeconomic variable (last period actual value) and $\sigma_{j,t}$ is the standard deviation of the $A_{j,t} - E_{j,t}$ difference.

$$J_{j,t} = a_j + \delta_j \cdot SA_{j,t} + \epsilon_{j,t} \tag{20}$$

where $J_{j,t}$ is the jump size in time t for the j announcement and $SA_{j,t}$ is the standardized macroeconomic news; sample is the days with jumps. Sample is the days with jumps, as those are more than the one with announcements. For the other abbreviations in the Table, see Table 1. The symbol * indicates significance in a 5% significance level.

The impact of macroeconomic standardized news releases (announcement surprises) to intraday jumps is revealed by:

$$J_{j,t} = a_j + \delta_j \cdot SA_{j,t} + \epsilon_{j,t} \tag{23}$$

where $SA_{j,t}$ is the standardized macroeconomic news as analyzed in subsection 4.1 and $J_{j,t}$ is the jump size in time t for the j announcement; sample is only the days with jumps. Regressions use only those intraday jumps that correspond to the relevant news releases. Results are depicted in Tables 6A and 6B. All impacts (δ_j) of 8:30 as well as 10:00 macroeconomic standardized news releases to intraday volatility-jumps are significant. Among the 8:30 announcements, the highest (lowest) impact (δ_j) is for the ES (US) asset and the EM (EM) announcement, across all assets/markets. Among the 10:00 announcements, the highest (lowest) impact (δ_j) is for the VIX (VIX) and the TR (RE) announcement, across all assets/markets. The highest impact across all 10:00 announcements is

TABLE 6B.

Impact (δ_j) of 10:00 macroeconomic standardized news releases to intraday volatility-jumps.

	CS	ES	TR	RE	All 10:00	All 8:30 & 10:00
$EURUSD$	0.010*	3.518e-4	−0.424*	−8.321e-3	9.523e-4	−0.026*
$AUDUSD$	−0.012*	−3.969e-3	0.033*	−5.233e-3*	0.015	−0.041*
$USDCAD$	−0.013*	3.306e-3	1.341	7.143e-3*	7.048e-3*	−0.048*
$GBPUSD$	−0.013*	1.540e-3*	0.077*	5.524e-3	1.213e-3*	−993.086
$USDJPY$	−0.027*	9.407e-3*	2.658	−6.881e-3*	0.053*	−0.047*
ES	0.137*	−0.027	10.264	0.152*	0.052*	0.056*
US	0.030*	5.747e-3*	1.546*	4.824e-3	−2.191e-3*	−0.028*
SPY	−0.072*	−0.011*	7.598	0.169*	8.309e-3*	-
QQQ	0.143*	0.054*	7.761	0.069*	−0.021*	-
MDY	−0.091*	−0.029*	7.085	0.098*	0.012*	-
IWM	0.226*	0.071*	15.866	2.157e-3*	−0.197*	-
DIA	0.056*	6.000e-3*	9.752	0.158*	0.059*	-
VIX	1.997	4.283	177.980	−0.710	−7.446	-
RUT	−0.145	0.061*	2.308	0.086*	3.827e-3*	-
INX	0.032*	1.274e-4	3.766	0.164*	0.163*	-
$INDU$	−0.067*	−0.033*	10.117	0.033*	0.076*	-
$COMPX$	−8.723e-3*	−0.113*	8.960	0.097*	0.017*	-

Notes. Table 6B reports the impact of 10:00 macroeconomic standardized news releases to intraday volatility-jumps. The standardized news is depicted as

$$SA_{j,t} = \frac{A_{j,t} - E_{j,t}}{sv_{j,t}} \tag{21}$$

where $A_{j,t}$ is the actual macroeconomic variable, $E_{j,t}$ is the expected (forecasted) macroeconomic variable (last period actual value) and $\sigma_{j,t}$ is the standard deviation of the $A_{j,t} - E_{j,t}$ difference.

$$J_{j,t} = a_j + \delta_j \cdot SA_{j,t} + \epsilon_{j,t} \tag{22}$$

where $J_{j,t}$ is the jump size in time t for the j announcement and $SA_{j,t}$ is the standardized macroeconomic news; sample is the days with jumps. Sample is the days with jumps, as those are more than the one with announcements. For the other abbreviations in the Table, see Table 1. The symbol * indicates significance in a 5% significance level.

for VIX, across all financial assets.[12] The impact (δ_j) is negative for most of 8:30 announcements[13] and positive for all 10:00 announcements, across financial assets/markets. Negative impacts indicate that positive macroeconomic news surprises (good news) result in significant negative jumps. The TR is the category with the highest in-magnitude impact across all

[12]There is not any financial asset/market with much higher in-magnitude impact among others, across the 8:30 announcements.

[13]Exceptions are the GDP and EM announcements. Negative impact have in average the All-8:30-&-10:00 announcements category.

8:30 and 10:00 announcements. The 8:30 announcements have a similar magnitude of impact to the 10:00 announcements.

Nextly, the importance of macroeconomic news releases to returns and volatility is examined. Firstly, the jumps series are split to news-related (jumps from those days with news releases) and non-news-related (jumps from those days without news releases). Secondly, the method of Ederington and Lee (1993) is followed, as recently applied by Evans (2011), to estimate the impact of jumps from either days with or days without news releases to either returns or volatilities series.

$$r_{j,t} = a_j + \beta_j^{r,nj} \cdot NJD_{j,t} + \beta_j^{r,nnj} \cdot NNJD_{j,t} + \epsilon_{j,t} \qquad (24)$$

where $r_{j,t}$ is the returns series, $NJD_{j,t}$ is the dummy variable equal to 1 if the jump is news-related, and $NNJD_{j,t}$ is the dummy variable equal to 1 if the jump is non-news-related.

$$RV_{j,t} = a_j + \beta_j^{RV,nj} \cdot NJD_{j,t} + \beta_j^{RV,nnj} \cdot NNJD_{j,t} + \epsilon_{j,t} \qquad (25)$$

where $RV_{j,t}$ is realized volatility.

TABLE 7A.

Changes ($\Delta\beta_j^r$) between the magnitudes of the impacts of news-related jumps ($\beta_j^{r,nj}$) and the coefficient of non-news-related jumps ($\beta_j^{r,nnj}$) on returns.

	All 8:30	All 10:00	All 8:30 & 10:00
$EURUSD$	77%	82%	57%
$AUDUSD$	70%	71%	56%
$USDCAD$	70%	81%	59%
$GBPUSD$	67%	79%	52%
$USDJPY$	73%	82%	57%
ES	38%	65%	14%
US	88%	88%	66%

Notes. Table 7A presents differences ($\Delta\beta_j^r$) between the impacts (magnitudes of the coefficient) of news-related jumps ($\beta_j^{r,nj}$) and the coefficient of non-news-related jumps ($\beta_j^{r,nnj}$) on returns. For the rest of the abbreviations, see Table 1. All differences are statistically significant n a 5% significance level.

Results concerning the importance of news-related jumps on returns (volatilities) are reported in Table 7A (7B). Tables concern the differences ($\Delta\beta_j^r$) between the magnitudes of $\beta_j^{r,nj}$ and $\beta_j^{r,nnj}$ (Table 7A) or ($\Delta\beta_j^{RV}$) between $\beta_j^{RV,nj}$ and $\beta_j^{RV,nnj}$ (Table 7B).

All differences ($\Delta\beta_j^{RV}$) across both 8:30 and 10:00 announcements as well as across all financial assets/markets are positive; so, the impact (magni-

TABLE 7B.

Changes ($\Delta\beta_j^{RV}$) between the impacts of news-related jumps ($\beta_j^{RV,nj}$) and the coefficient of non-news-related jumps ($\beta_j^{RV,nnj}$) on realized volatilities.

	All 8:30	All 10:00	All 8:30 & 10:00
EURUSD	80%	51%	53%
AUDUSD	71%	44%	52%
USDCAD	76%	50%	58%
GBPUSD	80%	53%	56%
USDJPY	86%	51%	55%
ES	64%	38%	32%
US	45%	13%	50%
SPY	85%	56%	-
QQQ	72%	46%	-
MDY	76%	52%	-
IWM	84%	50%	-
DIA	78%	56%	-
VIX	58%	42%	-
RUT	85%	61%	-
INX	85%	58%	-
INDU	83%	59%	-
COMPX	82%	77%	-

Notes. Table 7B presents differences ($\Delta\beta_j^{RV}$) between the impacts (magnitudes of the coefficient) of news-related jumps ($\beta_j^{RV,nj}$) and the coefficient of non-news-related jumps ($\beta_j^{RV,nnj}$) on realized volatility series. For the rest of the abbreviations, see Table 1. All differences are statistically significant n a 5% significance level.

tude of the coefficient) of news-related jumps ($\beta_j^{RV,nj}$) is higher than the coefficient of non-news-related jumps ($\beta_j^{RV,nnj}$) on realized volatility series. The values reported, are the average differences among only the coefficients that are significant. Concerning 8:30 announcements (Table 7A), the highest changes are for the US (ES) asset and the GDP (PI) announcement. Concerning 10:00 announcements (Table 7B), the highest changes are for the $GBPUSD$ (US) asset and the PI (ES) announcement.

Most of the coefficients from both days with and without news releases are significant, across the board of US financial assets. These results are valid for various lags as well, revealing volatility persistence. The coefficients for news-related jump dummies are larger than the coefficients for non-news-related jump dummies.

5. CONCLUDING REMARKS

The effects (β_j) of macroeconomic announcement surprises ($SA_{j,t}$) in most of realized volatilities are significant and negative. The expected component of announcement ($Di^e_{j,t}$) positively and insignificantly affect (β^e_j) volatility series. The unexpected (surprise) component ($Di^u_{j,t}$) highly, positively and significantly affect (β^u_j) volatility series. For all 8:30 and 10:00 announcements, the jump frequency of occurrence in the after-announcement period is higher than the jump frequency of occurrence in the period before the corresponding j announcement (i.e. ΔJF_j is positive). The number of occurrences of jumps which coincide with all macro announcements is less than the total number of jumps, meaning that not all jumps can be explained by announcements' releases. Jumps tend to cluster around announcement times on announcement days, for the majority of financial assets. The result that there are more positive than negative jumps, is a first indication of some asymmetry in reactions to news. For most of financial assets/markets and announcements, the contribution of the announcement of news to the average absolute size of intraday jumps (γ_j) is statistically significant and negative, across assets and 8:30 as well as 10:00 macro announcements. The impacts of standardized news releases (announcement surprises) to intraday jumps (δ_j) are negative for most of 8:30 announcements and positive for all 10:00 announcements, across financial assets/markets. The impact (magnitude of the coefficient) of news-related jumps ($\beta^{RV,nj}_j$) is higher than the impact of non-news-related jumps ($\beta^{RV,nnj}_j$) on realized volatility series (i.e. positive $\Delta\beta^{RV}_j$). Most of impacts are significant. Across all results, there are not significant differences either in significance or in magnitude between 8:30 and 10:00 announcements.

The foreign exchange market is the market with the most significant news-releases effect on volatility and jumps. This is consistent across the board of effect's measurements. Consistency also comes from the results upon the various exchange rates. Across all 8:30 & 10:00 announcements and in average, the highest (lowest) all-8:30-&-10:00 announcement effect on volatility series is for $GBPUSD$ ($USDJPY$) asset. The highest (lowest) volatility-jump frequencies upon all sample days comes from the $USDJPY$ for the 8:30 (10:00) announcements.

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