Rosangela Mastronardi (Switzerland), Michele Patané (Italy), Marco Paolo Tucci (Italy)

Macroeconomic news and Italian equity market

Abstract

Over recent years, the impact of macroeconomic news announcements on equity markets' returns has received considerable attention in academic literature. The prevailing opinion is that asset prices and volatility in stock markets react almost instantaneously to macroeconomic news announcements [7; 11; 12; 13]. This study investigates the effect of macroeconomic news on Italian stock returns and volatility. No previous research, using high frequency data, was found regarding the impact of US, German and Italian macroeconomic announcements on the Italian equity market. Only Bonfiglio and Guderzo (2000) and Casarin and Guderzo (2001) have studied the impact of both macro and financial news on the Comit Index, but their research was based on monthly data. Following the Hanousek et al. (2009) and Hanousek and Kočenda (2011) approach, the authors analyze the impact of such announcements by employing a version of the GARCH model with dummy variables.

Keywords: Italian stock market, macroeconomic news, high frequency data, GARCH.
JEL Classification: C51, E44, G14, G15.

Introduction

Over the past three decades, scheduled macroeconomic announcements have been the object of considerable attention both in the financial press and in academic literature. Most studies have tried to test if such information has an impact on financial markets and, at the same time, have attempted to identify what indicators investors consider when valuing stock prices. Understanding the effect of scheduled announcements on equity prices is useful for testing market efficiency and for predicting investors' reaction.

Earlier studies have typically focused on developed markets (the US, the UK and German). Specifically, both investors on the US and non-US financial markets are keenly interested in the evolution of the US economy because of its leading role in the global economy. The state of health of the US economy is undisputedly one of the most important variables that global investors follow when making investment decisions [16; 18; 22].

The literature on the effect of macroeconomic news on returns and volatility is quite significant and includes surveys concerning the bond market [3; 10], the foreign exchange market [1] and the equity market [7; 11; 12; 13].

About the roots of stock market volatility, Sabri (2002) finds that the transmission of high volatility of stock prices and stock crashes from one market to another, mainly exists, and materializes significantly during periods of sharp falling, and high volatility of stock prices. In transmission of volatility, three major developed stock markets have a significant effect on other stock markets, mainly the US, Japan, and London.

The first generation studies relied on daily or monthly data, while more recent studies have increasingly emphasized the use of finer sampled, high-frequency intraday data [12; 13; 14; 15; 20].

Since intraday data show seasonality patterns, discovering the price formation process when high frequency data are used is quite complex. Andersen and Bollerslev (1998) emphasized that scheduled macroeconomic news play an important role when modeling high frequency data.

Hanousek et al. (2009), Hanousek and Kocenda (2011) investigate how stock prices in the Czech Republic, Hungary, and Poland react to the US and euro area macroeconomic news. They study intraday data covering the period from mid-2003 until 2006 in the first study, and from mid-2004 until 2007 in the second study. In addition they classify macroeconomic shocks into positive, negative and zero impact. They find spillover effects of past S&P 500 and DAX 30 returns into emerging markets, with the Hungarian stock market showing the most sensitivity, followed by the Polish and Czech stock exchanges. Moreover, they discover an impact of EU news on the Hungarian and Polish markets. However, neither of these two papers takes into account multivariate modeling.

Unlike the previous studies, Nikkinen et al. (2006) test the impact of the US macroeconomic news announcements on 35 stock markets. Using a two-step approach, the authors first specify individual univariate GARCH models, extract the conditional variances, and then employ these to test the impact of news in a pooled model. They find that mature financial markets are closely integrated when it comes to how they react to US macroeconomic shocks. On the other hand, Latin American and transition economies are not affected by US news.

Another important issue in selecting the announcements is that evidence shows that the effect of macroeconomic news on the stock market is state dependent. Boyd et al. (2005) argue that

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information contained in news releases may be interpreted differently depending on the state of the economy. More generally, Andersen et al. (2007) find a similar result for a wide range of announcements in which bad macroeconomic news tends to have a negative effect on the S&P 500 during recessions, but a positive effect during expansions.

Numerous papers [7; 11; 12; 13] have studied the impact of macroeconomic news releases on financial markets. These studies differ in terms of the financial markets they cover, the frequency of observations and the time horizon examined. Hence, findings regarding which news systematically move markets, as well as their relative importance, are sometimes conflicting.

No previous research was found regarding the impact of the US, German and Italian macro-economic announcements on Italian equity markets' returns and volatility. Only Bonfiglio and Guderzo (2000) and Casarin and Guderzo (2001) analyze the behavior of the returns of the Comit Index around several important macro and micro news. In contrast to Bonfiglio and Guderzo (2000) and Casarin and Guderzo (2001), who used monthly data, our analysis is conducted on a high frequency dataset (5-minutes).

Mastronardi and Patanè (2009) in their study confirm and highlight the existence of relationship between the unexpected component of the principal US and German macroeconomic news and daily data concerning VIX and VDAX.

Further, as an extension to the above literature, we use stock price data using high frequency 5-minute data from January 04, 2010 through March 11, 2011, to provide more robust estimates of the effects of public information on Future FTSEMIB index. To date, such intraday analysis is not covered in the literature dedicated to the region. However, the analysis of the Europe pre-crisis samples reveals the presence of parameter instability in terms of absolute and relative size response to news, as well as in terms of statistical significance.

We begin our analysis by estimating the aggregate impact of news announcements. More specifically, following the LSE approach, we start from a large model so as to minimize the risk of omitted variables in explaining the impact of news on equity returns. Subsequently we reduce it via a series of tests. Our focus is on the overall impact of macroeconomic news, rather than their individual contributions.

We use the GARCH methodology to simultaneously model both conditional returns and the conditional variance of returns. We use this approach because previous studies tend to investigate the impact of macro-news only on conditional returns and assume that stock returns do not exhibit time-varying volatility. We also use this framework because it is better suited to capture the impact of macro-economic announcements of stock returns and stock market volatility in Italian stock markets. Then we estimate the associated M-GARCH model. The results are surprising.

1. The data

The empirical evidence of this paper is based on three groups of macroeconomic news (i.e., the US, German and Italian) and FTSEMIB Futures intraday data.

Following the main empirical literature on the impact of macroeconomic news, the expected data and actual data of the macroeconomic announcements, as well as the historical futures time series, have been obtained using the Bloomberg Professional® service. Concerning expected macroeconomic data, Bloom-berg collects financial markets' expectations for the headline information of these reports, i.e., the announced value of the main indicators. These expectations are the median forecasts of a panel of market participants and are compiled up to the day before the actual release of the indicator[1].

1.1. Italian stock index. The choice of frequency may be crucial for making inferences about the impact of the announcements. In order to analyze the impact of macro-news on the Italian stock market, we employ the intraday data of the Financial Times Stock Exchange Milano Indice Borsa Futures (FFTSEMIB), which is traded on Mercato Italiano dei Derivati (IDEM). The calculation of the futures index starts at 09:05 Central European Daylight Time (CEDT) and ends at 17:40 CEDT (which makes 104 returns per day).

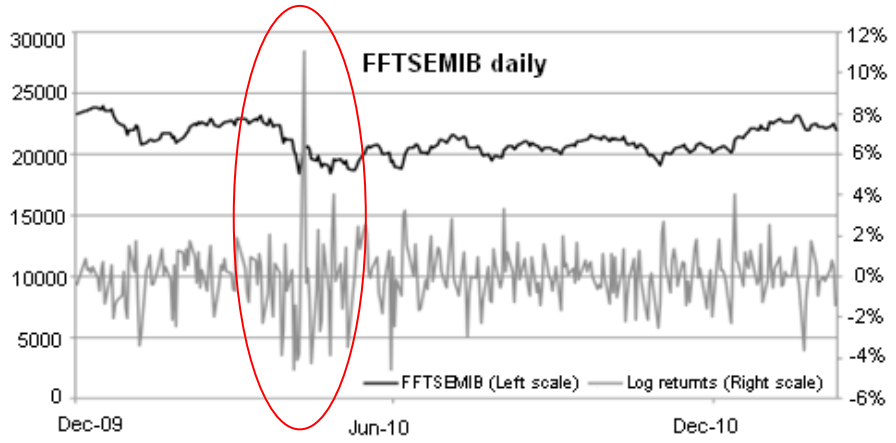
The dataset of stock index futures contracts covers the period between January 04, 2010 through March 11, 2011, for a total 306 trading days[2] and 31672 high-frequency return observations.

In keeping with standard practice, we have filtered the data for outliers and other anomalies. In addition to weekends, we removed several fixed holidays, including Christmas (December 24-26), New Year (December 31-January 01), Liberation Day in Italy (April 25) and Labor Day (May 01). We also cut the moving holidays of Easter Monday and Ascension Day.

Figure 1 plots the daily FFTSEMIB index for the period we considered in our analysis (January 04, 2010-March 11, 2011).

[1] Other alternative sources of expectations used in the news literature are Money Market Services' (MMS) expectations or Barron's expectations. All these surveys are highly correlated.

[2] Some trading days are shortened if they precede a banking holiday.



Notes: The dark line represents the historical daily price (left scale), the grey line represents the historical log retuns (right scale).

Fig. 1. Future FTSEMIB index from January 04, 2010-March 11, 2011

The figure clearly indicates that there was a period of considerable variability of stock returns. In particular, the biggest residuals occurred between May and June 2010 and correspond to the beginning of the debt problems of the PIIGS (Portugal, Ireland, Italy, Greece and Spain) and downgrades by the rating agencies.

We calculate returns over 5-minute intervals. The return on the FTSEMIB Future index ($R_{i,t}$) on the 5-minutes interval i on release day t is defined as the logarithm of the ratio of the current futures price ($FFTSEMIB_{I,t}$) over the price of the previous period ($FFTSEMIB_{I\text{-}1,t}$):

$$R_{i,t} = \ln\left[\frac{FFTSEMIb_{i,t}}{FFTSEMIb_{i-1,t}}\right].$$

1.2. Macroeconomic news. A variety of macroeconomic announcements have been used in academic literature. Our selection of macroeconomic announcements for the USA includes news events typically used in the literature and closely watched by participants in the stock market. The choice of German and Italian macroeconomic indicators is less straightforward.

To investigate the impact of macroeconomic news on stock futures, we focus mainly on a dataset of 16 different US macroeconomic announcements (news), 11 German and 6 Italian news announcements.

The US, German and Italian news announcements consist of monthly and quarterly releases on expected and realized macroeconomic fundamentals. Announcement dates are known in advance and typically have a specified release time. There are cases in which releases are considerably delayed, and thus the timing of the month m values of the different indicators is not homogeneous.

According to the efficient market hypothesis, only the unexpected part of the announcements should have an impact on stock returns. Therefore, for our purposes we define "news" as "surprises". There is news[1] i in the form of various macroeconomic releases or announcements that are known ahead of their scheduled release dates t. The extent of such news is not known but expectations on the market form a forecast whose values are factored in. Thus, the impact of such news is determined by the difference between the actual entity of the release and market expectations, rather than from the total quantities reported by the news itself. As units of measurement differ across macroeconomic variables, we follow the common practice[2] of classifying the news by their standard deviation, hence using standardized surprises[3] as regressors instead of the raw ones. To extract the unexpected news component from each announcement i (with i = 1…. 33), indicating the announcement type being investigated, we compute the surprise value of an announcement i in day t as the difference between the actually released value $A_{i,t}$ and the value expected by the market, $E_{i,t}$. $\hat{\sigma}$ is the sample standard deviation of ($A_{i,t}$ – $E_{i,t}$). The standardized surprise, $S_{i,t}$, is then used in our empirical analysis.

$$S_{i,t} = 100 * \left[\frac{A_{i,t} - E_{i,t}}{\hat{\sigma}(A_{i,t} - E_{i,t})}\right]^2.$$

Finally, we square all the standardized surprises to make everything positive and penalize larger surprises.

The macro-news series are similar to a dummy variable, with the "standardized news" replacing the 1 term, 0 otherwise. Hence, we matched "news" with return data, by placing the "standardized news" to the relevant return.

[1] For the purpose of this analysis we collected macroeconomic news for which there exists a Bloomberg survey, including a clearly defined calendar of releases as well as market expectations.
[2] See [3].
[3] This standardization does not affect the significance of the coefficients or the fit of the regressions.

We consider the immediate effect of each news at the time of its release up to half an hour.

Henceforth, we also defined good (i.e., positive surprise, when the Actual Value is greater than the Median, $A > E$) and bad (i.e., negative surprise, when the Actual Value is lower than the Median, $A < E$) news, depending on whether the released value of the macroeconomic indicator was higher or lower than the previously published consensus[1]. We have also considered announcements that are exactly in line with market expectations or not farther than ±10%.

The full set of macroeconomic announcements and the symbols used in our study are presented in Tables 1, 2 and 3. The tables also contain the number of announcements during the sample period. The announcements are issued monthly, except the Italian unemployment rate (UI) and the gross domestic product (GDP) for the three counties under observation, which are released quarterly.

Table 1. US news announcements for the whole period

Announcement	Symbol	Observations	# of good news	# of bad news	# of in line news	Release cycle
Business inventories	BIUS	15	8	6	1	Monthly
Chicago purchasing managers index	PMIUS	14	10	2	2	Monthly
Construction spending	CSUS	15	8	5	2	Monthly
Consumer confidence	CCUS	14	8	5	1	Monthly
Consumer prices	CPUS	14	7	3	4	Monthly
Durable goods orders	DGUS	14	4	8	2	Monthly
GDP	GDPUS	5	3	1	1	Quarterly
Housing starts	HSUS	14	8	6	-	Monthly
Industrial production	IPUS	14	8	4	2	Monthly
ISM manufacturing	ISMUS	15	10	2	3	Monthly
Leading indicators	LIUS	14	5	3	6	Monthly
Nonfarm payrolls change	NFPUS	15	4	9	2	Monthly
Personal income	PIUS	14	5	6	3	Monthly
Producer price	PPIUS	14	3	6	5	Monthly
Retail sales	RSUS	15	6	5	4	Monthly
Unemployment rate	UUS	15	9	2	4	Monthly

Table 2. German news announcements for the whole period

Announcement	Symbol	Observations	# of good news	# of bad news	# of in line news	Release cycle
Consumer prices	CPIG	14	5	4	5	Monthly
Factory orders	FOG	15	8	7	-	Monthly
GDP	GDPG	5	2	3	-	Quarterly
IFO business climate survey	IFOG	14	9	1	4	Monthly
Industrial production	IPG	15	5	9	1	Monthly
PMI manufacturing orders	PMIG	15	9	4	2	Monthly
Producer prices	PPIG	14	4	10	-	Monthly
Retail sales	RSG	15	3	9	3	Monthly
unemployment rate	UG	15	7	-	8	Monthly
ZEW	ZEWG	14	5	7	2	Monthly
Wholesale price	WPG	15	5	3	7	Monthly

Table 3. Italian news announcements for the whole period

Announcement	Symbol	Observations	# of good news	# of bad news	# of in line news	Release cycle
Consumer confidence	CCI	14	7	7	-	Monthly
GDP	GDPI	5	1	3	1	Quarterly
Industrial production	IPI	15	6	7	2	Monthly
Producer prices	PPII	14	5	6	3	Monthly
Retail sales	RSI	14	4	8	2	Monthly
Unemployment rate	UI	4	3	-	1	Quarterly

[1] However, there are some announcements, considered in our analysis, where the directional impact is reversed (i.e. unemployment rate, consumer price index and producer price index).

To include the macroeconomic news data in our analysis, the series are classified according to the country of origin and their sign, i.e., good news for the market, bad news for the market or in line with the market.

2. The econometric methodology

This section introduces the empirical framework for studying the relationship between the futures prices on the FTSEMIB, the surprises and the spillover effects between financial markets.

The econometric literature shows that the Generalized Autoregressive Conditional Heteroske-dasticity (GARCH) specification proposed by Boller-slev (1986) is the most widely used technique to model daily and intraday financial markets' frequencies that are not normally distributed and are characterized by skewness and leptokurtosis. The GARCH(1,1) model allows a better analysis of the asymmetric shocks on returns and, therefore, is best suited to this paper's testing purposes.

We start the analysis with the full-sample results. In our model we can find:

- the 5-minutes intraday futures on FTSEMIB returns, that is our dependent variable;

The independent variables are:

- a set of 33 news releases. More precisely, 16 US news, 11 German news and 6 Italian news;
- a set of several dummy variables (i.e., year, month, week, day of the week, and hour dummies to capture different effects);
- a time series of futures on the EUROSTOXX50, on the DAX, on the Mini SP500 and BUND to analyzed the effects of spillovers[1] from the two major developed markets (Germany and the US);
- a volatility term (GARCH (1,1)).

A time series model was constructed to estimate the intraday impact of the US, German and Italian news releases on the Italian equity market. The return generating model isolated the impact on Italian stock market index returns of foreign economic surprises and their own GARCH terms. More precisely, the 5-minute Italian stock index return $R_{i,t}$, was modeled as a GARCH(1,1).

The initial restrict model specification is:

$$R_{i,t} = \sum_{i=1}^{K} \beta_i S_i + \varepsilon_t,\ t = 1,2,3,...T,$$

where returns are a function of the news times their impact.

Concerning the restrict model of the conditional variance the general form is:

$$h_t = \omega + \alpha r_{t-1}^2 + \beta h_{t-1},\ t = 1,2,3...T.$$

Our initial estimation approach for the Italian equity index follows the literature on the stock market impact of macroeconomic announcements [13].

In addition to Hanousek and Kočenda (2011), we discuss not only the coefficient estimates, but also how good is our equation in explaining the dynamics of the endogenous variable. Only in Hanousek et al. (2009), where they estimate an M-GARCH model, is reported an *R*-squared of around 2% for the Prague Stock Exchange (p. 210). We regress the intraday log return on the surprise component of the macroeconomic announcements on a given day according to the following equation:

$$R_{i,t} = \sum_{k\in(1,US,G,EU,Bund)} \sum_{j=1}^{p} \pi_k R_{k,t-j}^{M} + \sum_{j=1}^{n}\sum_{q=3}^{3} \delta_{q,j} S_{US}^{j} + \sum_{j=1}^{n}\sum_{q=3}^{3} \kappa_{q,j} S_{G}^{j} + \sum_{j=1}^{n}\sum_{q=3}^{3} \vartheta_{q,j} S_{I}^{j} + \varepsilon_t \quad (1)$$

$$t = 1,2,3...T,$$

$$h_{i,t} = \omega + \sum_{m=1}^{r} \alpha_m \varepsilon_{t-m}^2 + \sum_{m=1}^{S} \beta_m h_{i,t-m} + \sum_{d=1}^{4} \psi_d W_d + \sum_{g=9:05}^{17:40} \phi_g \quad (2)$$

$$t = 1,2,3...T,$$

where in model 1, $R_{i,t}$ is the return of the FTSEMIB Futures at time *t*. We also include the lagged return of dependent variable $R_{i,t-j}$ so as to check for autocorrelation. The $R_{k,t-j}^{M}$ is captured by the lagged returns on a specific market *M* (MiniSP as a proxy for U.S. and DAX, EUROSTOXX50 and Bund for European Union) and is used to assess whether the dynamic spillovers between domestic and foreign returns change during periods in which macro-economic data are released. To this end, we introduce an interaction coefficient π_k.

Next, to analyze the impact of news (positive, negative or "in line") on Italian stock market returns, the series of macroeconomic releases are introduced as exogenous variables in the model specification. The term

$$\sum_{j=1}^{n}\sum_{q=3}^{3} \delta_{q,j} S_{US}^{j} + \sum_{j=1}^{n}\sum_{q=3}^{3} \kappa_{q,j} S_{G}^{j} + \sum_{j=1}^{n}\sum_{q=3}^{3} \vartheta_{q,j} S_{I}^{j}$$

[1] Since we are interested studying the dynamic interactions between the different exchanges, only the common trading hours are included in our analysis: i.e., intraday data between 09:05 and 17:40.

indicates the three news vector according to our classification of news, i.e., country of origin (the US, German and Italy) and sign of the surprises. Subscript q indicates the three qualities of the news (positive, negative, "in line"), while the superscript j indicates the different news announcements described in Tables 1-3. The coefficients δ, κ and ϑ measure the impact of the news on stock returns.

In the regression model (1), we introduce the macroeconomic releases as exogenous dummy variables. More precisely, each dummy variable is a series of zeros with observations equal to one on the minutes in which economic data is released.

Each category of news q is allowed to affect the futures index up to thirty minutes after the news is released.

The conditional variance equation, model 2, for the changes in the financial market series ($h_{i,t}$), is expressed as a function of one period lag of the variance and the residuals, and of various dummy variables.

The conditional variance $h_{i,t}$ represents the GARCH (1,1) model. The ARCH term, $\sum_{m=1}^{r} \alpha_m \varepsilon_{t-m}^2$, reflects the impact of surprises from previous periods that affect stock price volatility. The GARCH term, $\sum_{m=1}^{r} \beta_m h_{i,t-m}$, measures the impact of the forecast variance from previous periods on the current conditional variance or volatility. The sum of both coefficients (α plus β) indicates the speed of the convergence of the forecast of the conditional volatility to a steady state.

The second part of model 2 shows a set of different dummy variables. W_d allows accounting for the effect of specific days during a business week; ϕ_g captures the first and the last 15 minutes of trading in each trading day. As for the macroeconomic news, the above dummy variables take the value of 1 when the event occurs and 0 otherwise.

Hence, FTESEMIB returns are regressed on macro surprises. Different coefficients are statistically significant, once again showing that traditional macro surprises seem to impact stock returns.

We estimate the unrestricted equations (1) and (2) by applying the OLS method.

3. Empirical results

This section presents the estimated results of equations (1) and (2) over the full sample period (January 04, 2010-March 11, 2011)[1].

The results presented in Table 4, (models 1 and 2), provided a good approximation of both conditional mean and conditional volatility dynamics.

Unlike the Hanousek and Kocenda (2011) study, in which they discuss the coefficient estimates but they forget to discuss how good is their equation in explaining the dynamics of the endogenous variable, we find very high R^2 values (61%), as opposed to around 2% found by Hanousek et al. (2009) using an M-GARCH model. This is quite a good result if compared to previous studies.

Panel A of Table 4 (see Appendix) shows the estimation of results of the spillover between the Italian equity market and macroeconomics news. The Italian stock market was shown not only to respond to the US macro surprises, but also to German and Italian news. As a matter of fact, many German and Italian indicators have generally exhibited more statistically significant influences on the Italian market than the US macro surprises.

As shown in Panel A Table 4, at least five US, six German and three Italian macroeconomic news, out of thirty three news, exhibited a sizeable and statistically significant impact on the Italian equity market. The empirical results also indicate that the Italian futures returns adjust to both domestic and foreign news immediately. The main effect of all news on futures returns, except for the US unemployment rate and ZEW index, is within the same number minutes from the time of the release. Moreover, most of the full response of the news occurs within ten minutes of the release. The probability can be interpreted as the plausibility of a zero coefficient or no effect. *NA* in Panel A means that the impact is not significantly different from zero. These were included in the unrestricted version of the model but they did not help to explain the dynamics of the endogenous variable. For this reason we use a general-to-specific approach by defining a very general mean model. In addition to the news variables presented in Panel A of Table 4 (both at the time of release and at 5 minute intervals up to half an hour, i.e. up to NEWS(-6)), in Panel B we have only those dummy variables that yielded significant results[2] relative to the current values of the FFTSEMIB, of the FDAX, EUROSTOXX50, EUROBUND and MINISP futures. In particular, to assess the US spillover effect, we constructed a NEWSPFT vector which is the sum of the returns experienced in the MINISP stock market from the time the Italian stock market closes up to the end of the American trading day. It is hoped that this variable helps to explain how the FFTSEMIB behaves the

[1] As we write this paper, there are considerable uncertainties since we are in the middle of the EU debt crisis. As of this writing, the yield on Italian 10-year bonds stands at roughly seven per cent (spread over bund 573).

[2] In the full model we have considered several dummy variables to try to capture hour, day, week and month effects.

following morning at 9:05. The total number of variables in this unrestricted model is around 700. By applying the usual F-test we are able to end up with a model having only 64 parameters in the GARCH (1,1) version (67 when the dummies WEDNESDAY, THURSDAY and FRIDAY are added to the ARCH and GARCH terms in the variance equation).

It is worthwhile to underscore that all the coefficients on foreign news reflect the direct impact (earthquake effect) of the same on the Italian index, in addition to the effect that they have on the domestic, reference market. The latter can be viewed as the indirect effect on the Italian market (tsunami effect). In other words, this coefficient is a measure of the "unique effect" on Italian stocks in addition to the general effect on the world economy.

The surprises originating in the US that have an effect on the Italian equity index are business inventories, consumer confidence, ISM index, non-farm payrolls and unemployment. Business inventories (US_BI) that are "in line" with expectations exhibit a positive impact except for the (US_BI_(-1)). Concerning consumer confidence indicators, a lower than expected consumer confidence (US_CC_(-1)) generates a negative effect while an "in line " and a lower than expected surprise of the ISM index is reflected positively on stock returns, but negative changes reflect themselves only after half an hour of the news release. Looking at the impact of the employment indicators on the Italian index, we find that an "in line" unemployment release generates a positive effect, while the non-farm payrolls release provides ambiguous results. The below and above market expectations releases produce, respectively, positive (US_NFP(-1)) and negative (US_NFP(-2)) effects. Hence, a one-percent increase in the "in line" news related to the unemployment rate increases the FTSEMIB Futures index returns by 0.0011% (0.11 basis points). Alternatively, a one-percent increase in the positive news of non-farm payrolls decreases FTSEMIB returns by 0.00055% (0.055 basis points). The signs of the equity returns' response to statistically significant news are economically consistent in the first case, but not in the second case. Due to the fact that the impact of the latter result was slightly negative, the impact on the equity index was not significant. This outcome is probably linked to the current sovereign crisis or to the simultaneous release of some other news.

In terms of prices, there is no effect from the US, but there is an important and intuitively meaningful impact from German and Italian announcements. A positive and a negative outcome of German consumer prices has a positive effect.

Concerning German and Italian producer prices at time zero (time when the news is released), a value better than market expectations impacts stock returns positively (German_PPI and Italian_PPI). At the same time, German producer prices have a negative impact.

Looking at news from the real economy, German and Italian GDP[1] releases that are better than market expectations yield positive effects.

Finally, a positive movement of Italian consumer confidence is echoed by a negative influence on stock returns.

An interesting feature that we noticed was that conditional mean adjustments of stock returns to news releases were almost immediate (lag = 1), but the response faded away swiftly thereafter. Only very few of the lagged return coefficients were found to be significant: i.e., the impact on Italian equity returns occurred within five minutes of the US, German and Italian news releases[2]. For example, the fact that the parameter US_BI(-2) was not significantly different from zero may indicate that 10 minutes after the release some investors tended to take profits.

Amongst the 37 significant responses to macro-news, 15 have a positive impact on the Italian equity market, but five of them show a negative coefficient.

Concerning spillover effects, it is interesting to note in Panel B of Table 4 (see Appendix) that Dax and EUROSTOXX futures react up to twenty minutes after a shock in the FTSEMIB, while the response of the Bund and MiniSP weakened after 5-minutes.

We also found that none of the dummy variables turned out to be significant except for Dummy16_17 and Dummy17_1740 that show a slight impact on the Italian futures index. The result is probably justified by the fact that peak transaction volume and volatility usually occur before the close of the market.

It is interesting to notice that when an M-GARCH model is estimated, the term @SQRT(GARCH), does not look significantly different from zero[3]. Therefore, for this dataset there is no need to estimate the nonlinear model using the globally optimizing algorithm described in Tucci (2002).

Conclusions

This study has explored the intraday impact of the US, German and Italian macroeconomic news on the Italian stock market future index using high frequency 5-minute returns. In addition, we have analyzed the spillover effects between the Italian equity market and the returns on DAX, Eurostoxx,

[1] In line with the results finding by Funke and Matsuda (2002).
[2] Full results are available upon request.
[3] The variable @SQRT(GARCH) shows this result: 0.022972 (coefficient), 0.022972 (Std. error), 0.1328 (Prob).

MiniSP and Bund. A better understanding of the relationship between market and macroeconomic news, domestic and foreign, when news arrives onto the market may help investors devise more efficient strategies to either speculate or hedge portfolios.

The main findings are as follows.

The Italian equity market has been typically affected by domestic and foreign news. The general response of the returns to the news is very quick and dominates the time-period immediately following the release (at least up to ten minutes)[1]. Thus high frequency data are critical for the identification of impact of news on markets.

Overall, the results suggest that Italian equity returns are generally sensitive to the news originating in foreign markets. In particular, the analysis indicates that two German inflation measures (CPI and PPI), three US real macroeconomic variables (non-farm payrolls, the unemployment rate and business inventories), business climate and consumer confidence (ZEW index, ISM index and consumer confidence) and German GDP could be considered as potential market risk factors by investors. Hence, Italian stock markets react similarly to the information originating in the US and German. One interpretation for such behavior is that news revealed in the US and Germany is perceived as an important determinant of the fundamentals Italian equity prices. This can in turn be attributed to the economic linkages within the global economy.

Finally, we find that domestic news also affects Italian equity markets. The result is satisfactory because we find that three of the six news analyzed and classified as having a "high importance" (GDP, producer price index and consumer confidence)[2] influenced Italian equity returns.

Employing a GARCH(1,1) we tested the asymmetric effects, disentangling good from bad macroeconomic news.

Finally, we also analyze the effects of market spillovers considering the US, Germany and European indices. The results in Panel B of Table 4 show substantial spillovers affecting the Italian index. The Eurostoxx Index and the NEWSPFT vector exhibit the strongest spillover effects, followed by the DAX and our dependent variable.

The implication of these findings are relevant for researchers and investors, particularly when modeling the short-term dynamics of returns and volatility with a view to portfolio diversification. These results suggest a further investigation of the short-term interdependence of equity markets and the economic integration of Europe and the US.

Macroeconomic announcements are only one piece of information hitting financial markets. There is also other news that influence financial markets, such as earnings, FOMC meetings, statements from rating agencies. We reserve the task for future research by adding as regressors other important time series such as: oil price (to reflect the different impact that this variable has on the Italian economy as opposed to the German or the US economy, the price of gold that reflects international political tensions, the Italian BTP/Bund spread to reflects the sensitivity of the Italian stock market to the sovereign debt crisis).

We also think that in addition to the impact of macroeconomic news on financial markets, it should be productive to explore how the impact of macro-news changes during distinct stages of the economy (i.e., booms and recessions)[3] using even smaller time frames (1-minute).

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[1] Jennings and Starks (1985) show that most of the new information is incorporated into prices within 10 to 15 minutes. Jain (1988) reports that the response of the S&P500 index to the macroeconomic news is basically completed within one hour. Entorf et al. (2009) demonstrate DAX price chances due to news occur within one minute after the announcement.

[2] See [3] (Balduzzi, Elton and Green, 2001).

[3] During the period under research, Europe was involved in a sovereign debt crisis resulting from rising government debt levels around the world, and a wave of downgrading of government debt in some European states. For this reason in our analysis we did not consider adjusting our estimation to the different stages of the economy.

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Appendix

Table 4. Models of impact of macroeconomic news on returns

This table reports the estimated regression models for returns of Italian equity market. Autocorrelation of residuals can be rejected at 99% using a Breusch-Godfrey test.

	Positive impact			Negative impact			In line		
Variable	Coefficient	Std. error	Prob.	Coefficient	Std. error	Prob.	Coefficient	Std. error	Prob.
Panel A									
United States									
US_BI	NA	NA	NA	NA	NA	NA	0.002709	0.001310	0.0386
US_BI_(-1)	NA	NA	NA	NA	NA	NA	-0.001590	0.001021	0.1194
US_BI_(-2)	NA	NA	NA	NA	NA	NA	0.003248	0.000802	0.0001
US_BI_(-3)	NA	NA	NA	NA	NA	NA	0.005594	0.000640	0.0000
US_BI_(-5)	NA	NA	NA	NA	NA	NA	0.002667	0.000449	0.0000
US_CC	NA	NA	NA	0.000262	7.38E-05	0.0004	NA	NA	NA
US_CC_(-1)	0.000796	0.000195	0.0000	-0.000447	7.48E-05	0.0000	NA	NA	NA
US_ISM	NA	NA	NA	NA	NA	NA	0.001634	0.000207	0.0000
US_ISM_(-1)	NA	NA	NA	0.000616	0.000212	0.0037	NA	NA	NA
US_ISM_(-6)	NA	NA	NA	NA	NA	NA	-0.001001	0.000318	0.0017
US_NFP_(-1)	NA	NA	NA	0.000179	7.88E-05	0.0234	NA	NA	NA
US_NFP_(-2)	-0.000555	0.000208	0.0075	NA	NA	NA	NA	NA	NA
US_U_(-2)	NA	NA	NA	NA	NA	NA	0.001058	0.000311	0.0007

Table 4 (cont.). Models of impact of macroeconomic news on returns

	Positive impact			Negative impact			In line		
Variable	Coefficient	Std. error	Prob.	Coefficient	Std. error	Prob.	Coefficient	std. error	Prob.
German									
GERMAN_GDP	0.002611	0.000132	0.0000	NA	NA	NA	NA	NA	NA
GERMAN_PPI	0.000229	7.38E-05	0.0019	-0.001139	0.000302	0.0002	NA	NA	NA
GERMAN_PPI_(-2)	-0.000530	8.31E-05	0.0000	NA	NA	NA	NA	NA	NA
GERMAN_PPI_(-3)	-0.000303	7.69E-05	0.0001	NA	NA	NA	NA	NA	NA
GERMAN_RS	NA	NA	NA	-0.001039	6.48E-05	0.0000	-0.003935	0.000417	0.0000
GERMAN_RS_(-1)	-0.001139	0.000302	0.0002	NA	NA	NA	-0.001894	0.001148	0.0989
GERMAN_RS_(-4)	NA	NA	NA	-0.000262	7.97E-05	0.0010	NA	NA	NA
GERMAN_WP	7.28E-05	3.91E-05	0.0629	-0.005597	0.000660	0.0000	-0.004179	0.000220	0.0000
GERMAN_CPI_(-1)	0.000638	0.000124	0.0000	0.000638	0.000124	0.0000	NA	NA	NA
GERMAN_CPI_(-2)	0.000437	0.000162	0.0072	0.000437	0.000162	0.0072	NA	NA	NA
GERMAN_ZEW_(-2)	0.001229	0.000296	0.0000	NA	NA	NA	0.001229	0.000296	0.0000
Italy									
ITALIAN_GDP	0.003744	0.001806	0.0381	NA	NA	NA	NA	NA	NA
ITALIAN_GDP_(-1)	0.003856	0.001478	0.0091	NA	NA	NA	NA	NA	NA
ITALIAN_GDP_(-2)	0.005353	0.001230	0.0000	NA	NA	NA	NA	NA	NA
ITALIAN_PPI	0.000174	9.79E-05	0.0757	NA	NA	NA	NA	NA	NA
ITALIAN_CC_(-1)	-0.000992	0.000237	0.0000	NA	NA	NA	NA	NA	NA
R-squared		0.612200	Adjusted *R*-squared		0.611378	Durbin-Watson stat.		1.761097	
F-statistic		744.4396	Prob(*F*-statistic)		0.000000				

Panel B							
Variable	Coefficient	Std. Error	Prob.	Coefficient	Std. error	Prob.	
Spillover effects Europe				Spillover effects United States			
FFTSEMIB(-1)	-0.196751	0.005036	0.0000	NEWSP	0.015022	0.002850	0.000
FFTSEMIB(-2)	-0.074281	0.004564	0.0000	NEWSP(-1)	-0.006798	0.002923	0.020
FFTSEMIB(-3)	-0.028138	0.004326	0.0000	NEWSPFT	0.716693	0.006050	0.000
FFTSEMIB(-4)	-0.023997	0.004026	0.0000	NEWSPFT(-1)	0.129691	0.010147	0.000
FFTSEMIB(-5)	0.002688	0.001958	0.1698				
FFTSEMIB(-6)	0.003056	0.001927	0.1128				
FFTSEMIB(-7)	0.005513	0.001888	0.0035	Dummies			
FFTSEMIB(-8)	0.002381	0.001858	0.2000	DUMMY_16_17	-2.20E-05	7.13E-06	0.002
FFTSEMIB(-9)	-0.005585	0.001821	0.0022	DUMMY_17_1740	2.78E-05	7.18E-06	0.000
FDAX	0.210452	0.006265	0.0000				
FDAX(-1)	-0.110673	0.006355	0.0000				
FDAX(-2)	-0.045049	0.006588	0.0000				
FDAX(-3)	-0.032232	0.006568	0.0000				
FDAX(-4)	-0.012287	0.006381	0.0542				
EUROSTOXX_50	0.729321	0.005068	0.0000				
EUROSTOXX_50(-1)	0.292987	0.006300	0.0000				
EUROSTOXX_50(-2)	0.113677	0.006470	0.0000				
EUROSTOXX_50(-3)	0.058625	0.006346	0.0000				
EUROSTOXX_50(-4)	0.043506	0.006005	0.0000				
EURO_BUND	-0.057506	0.007611	0.0000				
R-squared	0.612200	Adjusted *R*-squared		0.611378			
F-statistic	744.4396	Durbin-Watson stat.		1.761097			
Prob(*F*-statistic)	0.000000	Breusch-Godfrey test		99%			