Explaining the Stock Market's Reaction to Macroeconomic Announcements

Aymen Belgacem

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Abstract: This paper aims to study the impact of macroeconomic announcements on stock returns. More specifically, it intends to measure the average response of the French stock market and to provide some theoretical explanations regarding the sources of this reaction. Using intraday data, the study shows that, according to previous studies, there is a little evidence of market reactions to those surprises. This result may be explained partly by the simultaneous revision of future cash flows and future interest rates, which renders the net effect on equities insignificantly different from zero.

Keywords: Asset Prices; Macroeconomic Announcements, Event Study, Present Value Model.
JEL Classification: G14, E44, G12

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1. Introduction

Scheduled macroeconomic announcements are still receiving a considerable amount of interest in both the financial press and the academic literature. Most of these studies are attempting to determine whether such information impacts the financial markets and, if so, which indicators investors most consider when valuing stock prices. Understanding the effect of scheduled macroeconomic announcements on equity prices is important for testing market efficiency and for anticipating market reactions.

This paper presents an empirical analysis of the relationship between scheduled macroeconomic announcements and equity returns. The first part of this paper estimates the average response of the French stock returns to macroeconomic announcements. This issue has mostly been investigated in the US context. To the best of our knowledge, Harju and Hussain (2006) and Dubreuille and Mai (2009) are unique in their attempt to test this relationship in the French market. Even while using high frequency data (5 minute interval), they found that only 5 of 11 selected American indicators have significant effects on the French market. Dubreuille and Mai (2009) used a portfolio of several companies listed on Euronext European platforms and found that European markets react more to US macroeconomic announcements than to European ones. Our contribution to the literature in this first part is twofold. Firstly, we use a larger sample of high frequency data and estimate not only the impact of local macroeconomic announcements, as in previous stock return studies, but also the impact of U.S. announcements. This decision is motivated by the central role of the U.S. in the development of the world economy. Thus, major U.S. economic indicators are important for the valuation of not only US stocks, but also the stocks in other countries. Secondly, unlike previous studies, we use an event study based on a multivariate model to estimate the average response of the French market to macroeconomic surprises. This approach allows us to analyze simultaneously the relationships among different variables, such as equity returns, interest rates and dividends, and their interactions with macroeconomic surprises. This approach also allows us to determine the dynamic response of the French stock

market and calculate the duration of the reaction. Despite the use of high frequency data, we find that macroeconomic announcements have little impact on stock returns. This result is similar to the results of the relevant literature (e.g., Dubreuille and Mai, 2009; Harju and Husain, 2006; Jones et *al.*, 2005). Harju and Hussain (2006) found that the stock market did not respond to more than half of the selected macroeconomic announcements. Jones et *al.* (2005) found that none of the 9 macroeconomic announcements used in their paper significantly impacted stock returns. These findings show that the use of high frequency data cannot explain the insignificant reaction to such announcements.

Previous studies have also suggested that the reaction depends on the business cycle. This hypothesis was tested in several papers (McQueen and Roley, 1993 Poitras, 2004, Li and Hu, 1998). Whereas McQueen and Roley (1993) accept this hypothesis, Li and Hu (2000) and Poitras (2004) do not reject the hypothesis of the stability of the reaction across business cycles. Thus, we find it necessary to extend the question of reaction sources and to find financial explanations to this surprising nonreaction, rather than explore the causes related to estimation methods and data, which previous scholars have explored in depth without uncovering any convincing answers. Thus, the main contribution of this paper is its attempt to combine theoretical and empirical stock price approaches to demonstrate empirically the transmission channels through which macroeconomic announcements can affect stock returns. The second part of this paper attempts to explain the lack of reaction to those announcements. Stock price is defined generally as the present discounted value of rationally forecasted future dividends. Economic news may impact future dividends, interest rates or both. Thus, the net effect of macroeconomic announcements on the stock price will be unknown *a priori*. Many papers have given this hypothesis without testing it. To the best of our knowledge, McQueen and Roley (1993) are unique in their attempt to assess whether the reaction is due to revisions in cash flows or revisions in the real interest rate used to discount those cash flows. However, their methodology does not test whether such announcements present risk factors and does not consider the dynamic correlation between cash flows and interest rates. In a recent paper, Bernanke and Kuttner (2005) have tried to

explain the impact of Federal Reserve policy on the stock market. Therefore, the approach in this paper is an application to other macroeconomic announcements that give us some information about the state of the economy.

The remainder of this paper proceeds as follows: Section 2 describes the data sample and estimates the average response of the French stock market to scheduled macroeconomic announcements by using intraday data. Section 3 gives some details regarding our explanation of this reaction. Section 4 presents our conclusions.

2. The impact of macroeconomic announcements on stock returns: an intraday event study

2.1 Data

The sample period begins in January 1997 and ends in December 2007. We include the 5-minute data of the CAC 40 index. We also select some macroeconomic announcements that have been found to affect equity prices significantly in recent papers[1]:

- the consumer price index (monthly) as an indicator of inflation;
- unemployment rate (monthly), industrial production (monthly) and household consumption (monthly), which are some of the more timely indicators of the state of the economy;
- housing starts (monthly) as a real estate indicator[2].

As noted in the introduction, both American and French economic announcements are used to investigate their effect on the French stock market. The dates of announcements are collected from the INSEE[3] and BLS[4] web sites and checked afterwards on Bloomberg. We also try to separate the expected from

[1] See, e.g., Jones et *al.* (2005), Rigobon and Sack (2006) and Dubreuille (2007).
[2] As we did not find any data about the French economy, only U.S. housing starts indicator is used in this study.
[3] INSEE (French: *Institut National de la Statistique et des Études Économiques*,) is the French National Institute for Statistics and Economic Studies
[4] BLS: Bureau of labor statistics

the unexpected part of the news. The standard way to separate these elements is to compute the surprise as the difference between the real change of the indicator value and the market consensus forecast. One way of rendering surprises comparable is to divide them by their standard deviation, as described by Fleming and Remolona (1997) and Balduzzi et *al.* (2001). Bloomberg and MMS forecasts are used to measure the market median consensus forecasts of macroeconomic news. Descriptive statistics of the data are presented in appendix1.

2.2 Testing for news impact

This section investigates the intraday dynamic response of the French stock market to macroeconomic announcements in a standard fashion by using the event study approach. Formally, the regression format is as follows:

$$\textbf{Erreur ! Signet non défini.} R_t = \alpha + \beta S_{i,t} + \varepsilon_t \quad (1)$$

Here, R_t is the CAC 40 return, and $S_{i,t}$ is the standardized surprise for the i^{th} macroeconomic announcement at time t, as defined above. The error term represents the factors other than the selected announcements that affect equities. The stock returns are calculated in 4 different intervals around the time of the announcement as the log difference between the CAC 40 price 5 minutes before the announcement and the price 5, 10 and 30 minutes after the announcement. Because French macroeconomic indicators are released before 9h a.m. and American indicators are released between 2h30 p.m. and 4h p.m., we separate the effect of the two categories of information by defining the fourth interval as the log difference between the CAC 40 price at 10h a.m. and the closing price of the preceding day for French macroeconomic announcements. This interval represents the log difference between the closing price of the current day and the price at 2h p.m. for U.S. macroeconomic announcements. The results of the regression are summarized in table 2.

Table 2: Intraday event study

		Interval 1 [-5 min, +5 min]		Interval 2 [-5 min, +10 min]		Interval 3 [-5 min, +30 min]		Interval 4	
		α	β	α	β	α	β	α	β
CPI		**1.3 E-3 ***	4.2 E-4	**1.6 E-3 ****	4 E-4	**2 E-3 *****	4 E-4	7 E-4	**3.5 E-3 ****
		(0.7 E-3)	(9.4 E-4)	**(0.7 E-3)**	(9 E-4)	**(0.8 E-3)**	(9 E-4)	(1 E-3)	**(1.3 E-3)**
R^2	LB(12)	2 E-3	0.053*	1.7 E-3	0.017**	2.0 E-3	0.03**	0.1	0.01***
HCONS		-1.4 E-3	**-3.3 E-3 ****	-1.2 E-3	**-3.5 E-3 ****	-1.0 E-3	**-3.4 E-3 ****	1.6 E-3	-1.2 E-3
		(2.0 E-3)	**(1.6 E-3)**	(2.0 E-3)	**(1.6 E-3)**	(1.9 E-3	**(1.6 E-3)**	(1.1 E-3)	(0.9 E-3)
R^2	LB(12)	0.03	0.75	0.04	0.62	0.035	0.77	0.01	0.001***
UNEMP		-4.0 E-3	3.6 E-3	-3.9 E-3	3.8 E-3	-4.0 E-3	3.9 E-3	**1.9 E-3 ***	3.7 E-3
		(3.2 E-3)	(3.7 E-3)	(3.3 E-3)	(3.8 E-3)	(3.4 E-3)	(3.8 E-3)	**(0.9 E-3)**	(4.1 E-3)
R^2	LB(12)	6.0 E-3	0.99	7.0 E-3	0.99	7.5 E-3	0.99	8.0 E-3	0.79
IP		-5.2 E-3	3 E-5	-4.9 E-3	2.5 E-4	-4.1 E-3	5.9 E-4	**2.1 E-3 ****	**1.7 E-3 ***
		(4.3 E-3)	(1.8 E-3)	(4.4 E-3)	(1.9 E-3)	(4.3 E-3)	(1.9 E-3)	**(0.9 E-3)**	**(0.9 E-3)**
R^2	LB(12)	3.0 E-4	0.99	3.2 E-5	0.99	2.0 E-4	0.99	3.0 E-2	0.4
CONF		**-1.7 E-3 ***	8.9 E-4	-1.5 E-3	7.0 E-4	-1.6 E-3	5.0 E-4	-5.3 E-4	6.4 E-4
		(0.8 E-3)	(6 E-4)	(1 E-3)	(7 E-4)	(0.9 E-3)	(8 E-4)	(1.0 E-3)	(1.1 E-3)
R^2	LB(12)	0.015	0.67	8.4 E-3	0.58	3.9 E-3	0.28	6.0 E-3	0.48
CPIUS		3.7 E-4	**-9.6 E-4 ****	3.9 E-4	**-8.6 E-4***	-7.5 E-5	**-1.5 E-3 ***	-1.9 E-4	-1.7 E-4
		(3.3 E-4)	**(5 E-4)**	(3.2 E-4)	**(5 E-4)**	(4 E-4)	**(8 E-4)**	(6.8 E-4)	(5.1 E-4)
R^2	LB(12)	0.08	0.95	0.05	0.94	0.08	0.46	8.0 E-4	0.52
HCONUS		-2.9 E-5	**2.7 E-4 ***	1.2E-05	2.1 E-4	-2.6 E-4	2.4 E-4	**1.2 E-3 ***	3.5 E-4
		(1.5 E-4)	**(1.5 E-4)**	(2.2 E-4)	(2.1 E-4)	(2.9 E-4)	(2.4 E-4)	**(8 E-4)**	(5 E-4)
R^2	LB(12)	0.03	0.79	9.0 E-3	0.7	7.0 E-3	0.39	3.0 E-3	0.64
UNEMPUS		4.3 E-4	-1.3 E-4	4.4 E-4	-1.9 E-4	3.9 E-4	-5.6 E-4	3.6 E-4	3.6 E-3
		(5.3 E-4)	(4 E-4)	(5 E-4)	(5 E-4)	(7 E-4)	(7 E-4)	(9 E-4)	(4 E-3)
R^2	LB(12)	5.6 E-4	0.86	1.1 E-3	0.9	6.7 E-3	0.91	0.02	0.4
IPUS		**-4.3 E-4 ****	-1.5 E-4	**-4.6 E-4 *****	-2.5 E-4	-5.2 E-4	-6.4 E-4	-4.7 E-4	**1.8 E-3 ***
		(1.8 E-4)	(2.2 E-4)	**(1.7 E-4)**	(2.2 E-4)	(3.8 E-4)	(3.5 E-4)	(7 E-4)	**(1 E-3)**
R^2	LB(12)	4.5 E-3	0.17	0.012	0.18	2.8 E-4	0.19	0.08	0.04**
CONFUS		**-7.6 E-4 ****	**1.5 E-3 *****	**-1.3 E-3 ****	**1.4 E-3 *****	-9.5 E-5	8.8 E-4	**-2.2 E-3 *****	**2.4 E-3 *****
		(3.2 E-4)	**(4.8 E-4)**	**(3.3 E-4)**	**(4.9 E-4)**	(7 E-4)	(8 E-4)	**(7.5 E-4)**	**(8 E-4)**
R^2	LB(12)	0.14	0.16	0.14	0.64[(a)]	0.14	0.33	0.14	0.001***
HOUSING		**5.2 E-4 ***	1.5 E-4	2.1 E-4	4.9 E-4	2.2 E-4	6.2 E-4	-5.7 E-4	6.1 E-4
		(3 E-4)	(2.5 E-4)	(3.3 E-4)	(3.8 E-4)	(3.8 E-4)	(4.9 E-4)	(7.1 E-4)	(6.2 E-4)
R^2	LB(12)	2.5 E-3	0.76	0.024	0.64	0.03	0.51	8.5 E-3	0.24

Significance level: 1% (***), 5% (**) and 10% (*). LB(12) is the p-value of the Ljung Box autocorrelation test (lag 12).
Standard errors are shown in parentheses and are corrected for autocorrelation and heteroskedasticity using the Newey-West method.
France: CPI: Consumer price index, **HCONS:** Household consumption, **UNEMP:** Unemployment rate, **IP:** Industrial production, **CONF:** Consumer confidence.
U.S.: CPIUS: Consumer price index, **HCONUS:** Household consumption, **UNEMPUS:** Unemployment rate, **IPUS:** Industrial production, **CONFUS:** Consumer confidence, **HOUSING:** Housing starts.

Despite the use of high frequency data, there is little evidence of market responses to macroeconomic announcements. The coefficients are close to zero, and the R-Squared does not exceed 14%. Seven of the 11 selected macroeconomic announcements impact stock returns. Whereas some macroeconomic announcements have an immediate impact on the CAC 40 (French household consumption, U.S. CPI, household consumption and consumer confidence), others significantly affect the French market 30 minutes after the announcement (CPI and industrial production). Consequently, we can confirm the hypothesis that investors in the French stock market regard domestic and U.S macroeconomic announcements as an important source of information when valuing stock prices. However, these announcements are far from the most influential source of news. News about inflation, U.S consumption and real economic activity are particularly considered in attention by investors. This result confirms the important role of the U.S. economy in determining the development of the world economy.

Let us now discuss the significant effect of each announcement and compare our findings with those of the recent literature. An unanticipated increase (decrease) in industrial production and U.S. consumer confidence leads to an increase in stock returns. This result aligns with those of the recent literature (e.g., Rigobon et Sack, 2005; Becker et *al.*, 1995) and shows that news about business conditions reflect good news for stock markets. Thus, such news helps investors revise their expected cash flows. Nevertheless, the impact of news about inflation (i.e., the CPI index) seems ambiguous. Theoretically, in a standard valuation model, a positive surprise regarding inflation implies a positive effect on rates, but because this news does not contain any information about economic growth, a positive surprise regarding inflation should not affect future cash flows. Thus, asset prices should fall. Rigobon and Sack (2006) and Schwert (1981) found an empirical basis for this presumption, but Fair (2002) argued that "price events" can also have a positive impact on future cash flows, which explains why asset prices can respond positively to surprises regarding inflation.

The impact of household consumption on stock returns is also ambiguous and depends on the announcement's origin. Whereas an unanticipated increase in

French consumer confidence leads to a decrease in stock returns, we observe the opposite effect when the US indicator is released. According to Chen et *al.* (1986), a positive surprise regarding consumption may indicate economic growth, which, on average, increases expected future dividends and renders equity investments more attractive. Conversely, a positive surprise may also signal a restrictive monetary policy, especially if this consumption increase is followed by a rise in inflation. Thus, the impact of this macroeconomic announcement is *a priori* ambiguous.

In conclusion, these results show that the lack of reaction from the stock market to some economic news is not only due to data frequency. Rather, this lack of reaction may be explained by a simultaneous effect on different stock price components. This assumption will be discussed in detail in the next section.

3. Sources of the reaction of stock returns to macroeconomic announcements

In this section, we attempt to answer a more difficult question: what are the sources of the French stock market's reaction or lack of reaction to macroeconomic surprises? In a standard fashion, an unexpected increase (decrease) in asset prices may be related to a rise (fall) in expected future dividends, a decrease (increase) in the expected future real interest rates used to discount those cash flows or a decrease (decrease) in expected future excess returns (i.e., the risk premium associated with holding stocks). Unfortunately, the standard event study methodology does not allow us to test this effect. The following sections investigate these relationships.

3.1 The Campbell and Ammer (1993) approach

One way to empirically answer the question is to use an extension of the Campbell and Ammer (1993) linearization. In brief, their method decomposes the unexpected excess return into three components, which we call hereafter news about future excess returns (i.e., risk premium), news about future dividends and news about future real interest rates. The method then uses a VAR model to proxy those components.

The one-period excess return y_{t+1} is defined as the total return on equities minus the risk-free rate. Campbell and Ammer (1993) show that the innovation in current excess return can be decomposed into the following:[5]

$$e^{y}_{t+1} = \tilde{e}^{d}_{t+1} - \tilde{e}^{y}_{t+1} - \tilde{e}^{i}_{t+1} \tag{2}$$

That is, the unexpected excess return e^{y}_{t+1} is equal to the news about future dividends $\tilde{e}^{d}_{t+1}$ minus news about future real interest rates $\tilde{e}^{i}_{t+1}$ and news about future excess returns $\tilde{e}^{y}_{t+1}$. These components are defined as:

$$\begin{aligned}
\tilde{e}^{d}_{t+1} &= (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} \\
\tilde{e}^{i}_{t+1} &= (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j i_{t+1+j} \\
\tilde{e}^{y}_{t+1} &= (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j e_{t+1+j}
\end{aligned} \tag{3}$$

Here, ρ refers to the discount factor, which is equal to the steady-state equity price divided by the equity price plus dividend, and E is the expectations operator.

Implementing this decomposition requires the use of empirical proxies for the expectation terms that appear in the equation system (3). Campbell and Ammer (1993) model expectations by using a forecasting vector autoregression, which includes the variables of interest (i.e., excess returns and real interest rates) and other indicators that may be useful in forecasting these two variables. Following Campbell and Ammer (1993), we use a VAR that includes the following: (1) the excess stock returns (e_t), which are computed as the stock returns with dividend payments in excess of the one-month Eurocurrency interest rate; (2) the real interest rate (i_t), which is defined as the difference between the one-month Eurocurrency interest rate and the one-month ahead consumer price index; (3) the change in the one-month Eurocurrency interest rate, which serves as a proxy

[5] A sketch of the linearization is reported in appendix 2.

for the nominal interest rate ($\Delta y_{1,t}$); (4) the risk premium (Δp_t), which is calculated as the difference between Baa and Aaa bond yields; and (5) the change in dividend yields (Δdy_t). All of those variables are daily based and are extracted from *Datastream.*

Using the AIC and SIC criteria, we choose a 3 lag VAR. Formally, the regression format is as follows:

$$z_{t+1} = \sum_{i=1}^{3} A_i z_{t+1-i} + \omega_{t+1} \quad (4)$$

Where z_t is the (5×1) vector of the state variables defined above. To determine the impact of macroeconomic surprises, we rewrite equation (4) as follows:

$$z_{t+1} = \sum_{i=1}^{3} A_i z_{t+1-i} + \sum_{j=1}^{11} {}_j S_{j,t+1} + \omega_{t+1}^{\perp} \quad (5)$$

Erreur ! Signet non défini. Here, $S_{j,t}$ is the standardized surprise for the j^{th} macroeconomic announcement at time t. The error term $\omega_{t+1}^{\perp} = \omega_{t+1} - \sum_{j=1}^{11} {}_j S_{j,t+1}$ represents the factors other than the selected announcements that affect the variables of interest. The results of the regression are summarized in table 3. Only lagged excess return appears to impact the stock market, and the R-squared of the regression is close to zero. This result aligns with Malliaropulos's (1998) findings and can be explained by the unpredictability of the French stock market based on the information set used in the VAR.

Panel B of table 3 shows the impact of macroeconomic surprises on the variables used in the vector autoregression. The results confirm our finding in the first section. There is little evidence regarding the stock market reaction to macroeconomic surprises. Only the U.S. consumer confidence indicator impacts the French stock market. Economic announcements are not regarded as especially important news, which may explain the lack of stock market reaction. From a theoretical standpoint, this result may be due to the simultaneous effect on two or three components of stock returns, which render the net effect on equity prices insignificantly different from zero (Rigobon and Sack, 2006; Mcqueen and Roley, 1993). Testing this hypothesis is more important than simply suggesting it. We will investigate this hypothesis in the subsections that follow.

Table 3: VAR estimation

Variables: e_t: CAC 40 excess returns, i_t: real interest rate, $\Delta y_{1,t}$: change in nominal interest rate, Δp_t: change in risk premium, Δdy_t: dividend yield.

Significance level: 1% (***), 5% (**) and 10% (*). Q(12) is the p-value of the multivariate portmanteau test (lag 12).

Standard errors are shown in parentheses and are corrected for autocorrelation and heteroskedasticity.
France: CPI: Consumer price index, **HCONS:** Household consumption, **UNEMP:** Unemployment rate, **IP:** Industrial production, **CONF:** Consumer confidence,
U.S.: CPIUS: Consumer price index, **HCONUS:** Household consumption, **UNEMPUS:** Unemployment rate, **IPUS:** Industrial production, **CONFUS:** Consumer confidence, **HOUSING:** Housing starts.

Panel A: State variables

	e_{t-1}	e_{t-2}	e_{t-3}	i_{t-1}	i_{t-2}	i_{t-3}	$\Delta y_{1,t-1}$	$\Delta y_{1,t-2}$	$\Delta y_{1,t-3}$	Δp_{t-1}	Δp_{t-2}	Δp_{t-3}	Δdy_{t-1}	Δdy_{t-2}	Δdy_{t-3}
e_t	0.009	-0.025	**-0.080*** **	0.227	-0.289	0.009	-0.012	-0.014	0.006	-0.018	0.009	0.001	0.002	0.002	-0.018
	(0.031)	(0.032)	**(0.031)**	(0.408)	(0.5)	(0.296)	(0.015)	(0.017)	(0.017)	(0.014)	(0.014)	(0.012)	(0.02)	(0.017)	(0.015)
i_t	-5 E^{-5}	-4 E^{-4}	0.002	**0.977*** **	0.005	**-0.025*** **	**-0.003***	**-0.002*** **	**-0.001***	2 E^{-4}	-2 E^{-5}	2 E^{-4}	2 E^{-4}	3 E^{-5}	7 E^{-4}
	(0.001)	(0.001)	(1.2 E^{-3})	(0.005)	(0.005)	**(0.005)**	**(1.7 E^{-3})**	**(9.9 E^{-4})**	**(5 E-4)**	(5.6 E^{-4})	(4.7 E^{-4})	(5 E^{-4})	(4 E^{-4})	(5 E^{-4})	(6 E^{-4})
$\Delta y_{1,t}$	0.045	0.057	0.034	0.496	-0.136	-0.238	**-0.370*** **	**-0.153*** **	**-0.070***	0.001	**0.036*** **	0.005	-0.010	0.047	0.017
	(0.038)	(0.036)	(0.027)	(0.313)	(0.444)	(0.321)	**(0.055)**	**(0.042)**	**(0.038)**	(0.013)	**(0.015)**	(0.015)	(0.031)	(0.032)	(0.018)
Δp_t	-0.267	0.206	-0.053	-0.005	0.520	-0.420	**0.050*** **	0.016	0.018	-0.026	**0.072*** **	0.019	**-0.178*** **	**0.244*** **	-0.045
	(0.173)	(0.232)	(0.059)	(0.388)	(0.593)	(0.473)	**(0.022)**	(0.031)	(0.022)	(0.039)	**(0.037)**	(0.020)	**(0.171)**	**(0.215)**	(0.046)
Δdy_t	-0.104	0.014	0.056	-0.120	0.259	-0.028	-0.007	0.029	0.003	0.011	3 E^{-4}	-0.001	**-0.066** **	**-0.001**	0.025
	(0.097)	(0.036)	(0.036)	(0.431)	(0.522)	(0.308)	(0.022)	(0.025)	(0.02)	(0.015)	(0.015)	(0.014)	**(0.086)**	**(0.019)**	(0.017)

Panel B: The impact of macroeconomic announcements on state variables

	French announcements					U.S. announcements						R^2	Q(12)
	CPI	HCONS	UNEMP	IP	CONF	CPIUS	HCONUS	UNEMPUS	IPUS	CONFUS	HOUSING		
e_t	9.3 E^{-4}	-1.4 E^{-3}	-1.3 E^{-3}	-5.8 E^{-4}	-2.0 E^{-3}	-1.7 E^{-3}	5.6 E^{-4}	-3.8 E^{-4}	1.5 E^{-3}	**2.9 E^{-3} *** **	-1.9 E^{-4}	0.02	
	(0.001)	(0.001)	(0.001)	(0.001)	(1.2 E^{-3})	(1.1 E^{-3})	(0.001)	(0.001)	(0.001)	**(1 E^{-3})**	(0.001)		
i_t	**4.7 E^{-5} *** **	-1.6 E^{-5}	-1.3 E^{-5}	3.0 E^{-5}	-9.5 E^{-5}	-1 E^{-4}	6.0 E^{-5}	-4.6 E^{-5}	1.0 E^{-4}	2.6 E^{-5}	**-1.7 E^{-4} ***	0.91	
	(2.2 E^{-5})	(1.4 E^{-5})	(4.4 E^{-5})	(3.4 E^{-5})	(6.3 E^{-5})	(8.1 E^{-5})	(6.3 E^{-5})	(6.7 E^{-5})	(1.7 E^{-4})	(6.0 E^{-5})	**(9.3 E^{-5})**		
$\Delta y_{1,t}$	2.1 E^{-3}	-4.1 E^{-3} *	-2.7 E^{-3}	-1.3 E^{-4}	-1.5 E^{-3}	1.1 E^{-3}	-2.0 E^{-3}	**1.7 E^{-3}** **	-3.7 E^{-4}	2.1 E^{-3}	-2.5 E^{-4}	0.16	0.9
	(0.002)	(0.002)	(1.7 E^{-3})	(7.9 E^{-4})	(1.9 E^{-3})	(0.001)	(1.5 E^{-3})	**(7.9 E^{-4})**	(7.7 E^{-4})	(1.5 E^{-3})	(6 E^{-4})		
Δp_t	-2.2 E^{-3}	1.8 E^{-3}	-1.4 E^{-4}	-4.9 E^{-4}	**-1.8 E^{-3} *** **	-7.9 E^{-4}	1.6 E^{-3}	-2.9 E^{-3}	-3.8 E^{-4}	-1.3 E^{-3}	1.3 E^{-4}	0.06	
	(1.9 E^{-3})	(0.002)	(0.001)	(0.001)	**(8.5 E^{-4})**	(1.6 E^{-3})	(1.3 E^{-3})	(2.3 E^{-3})	(0.002)	(1.4 E^{-3})	(0.001)		
Δdy_t	-4.7 E^{-4}	1.4 E^{-3}	7.2 E^{-4}	2.7 E^{-4}	-8.6 E^{-4}	1.7 E^{-3}	-9.2 E^{-4}	1.1 E^{-3}	**-2.8 E^{-3}** **	**-3.6 E^{-3}*** **	-1.1 E^{-3}	0.02	
	(1.2 E^{-3})	(0.001)	(0.001)	(0.001)	(0.003)	(1.1 E^{-3})	(0.001)	(1.5 E^{-3})	**(1.4 E^{-3})**	**(1.4 E^{-3})**	(1.3 E^{-3})		

3.2 Variance decomposition

After the forecasting VAR has been estimated, the three components of unexpected excess returns can be calculated in accordance with Campbell and Ammer's (1993) specifications as follows:

$$
\begin{aligned}
e^{y}_{t+1} &= s_y \omega_{t+1} \\
\tilde{e}^{y}_{t+1} &= s_y \rho A (1-\rho A)^{-1} \omega_{t+1} \\
\tilde{e}^{i}_{t+1} &= s_i (1-\rho A)^{-1} \omega_{t+1} \\
\tilde{e}^{d}_{t+1} &= e^{y}_{t+1} + \tilde{e}^{y}_{t+1} + \tilde{e}^{i}_{t+1}
\end{aligned}
\qquad (6)
$$

where s_y and s_i are the appropriate selection matrix.

Table 4 reports the variance decomposition for French excess stock returns into three components that may be correlated with one another. Therefore, we could calculate the variance of the current excess return into the sum of the three variances plus the relevant three covariances:

$$
\begin{aligned}
Var\left(e^{y}_{t+1}\right) = {} & Var\left(\tilde{e}^{d}_{t+1}\right) + Var\left(\tilde{e}^{i}_{t+1}\right) + Var\left(\tilde{e}^{y}_{t+1}\right) \\
& -2Cov\left(\tilde{e}^{d}_{t+1}, \tilde{e}^{i}_{t+1}\right) - 2Cov\left(\tilde{e}^{d}_{t+1}, \tilde{e}^{y}_{t+1}\right) + 2Cov\left(\tilde{e}^{i}_{t+1}, \tilde{e}^{y}_{t+1}\right)
\end{aligned}
\qquad (7)
$$

The table shows that the variance is almost attributable to the variance of innovations in dividends. This term explains 86% of the variance in excess returns in the French stock market. The contribution of the real interest rate to the total variance in excess returns is negligible and is approximately 0,1%. The variance in the risk premium component is also negligible, but the covariance between the future dividends and the risk premium explains 14% of the total variance in unexpected excess returns. All of the other components are not significantly different from zero. Malliaropulos (1998) claims that these findings result from the unpredictable nature of excess returns in the French stock market. The unexpected excess return seems to be completely moved by the arrival of news about future dividends. This variance decomposition method has been used in the literature within the context of the U.S. and European markets:

Campbell and Ammer (1993) show that the variance in expected future excess returns in the U.S. market accounts for 101% of the variance in the current equity return. Dividends contribute 24.5% of the variance, and the contribution of the real interest rate is negligible. This result is confirmed by Cuthbertson et *al.* (1999) within the context of the UK market, but the result is not consistent with Malliaropulos's (1998) findings regarding the French stock market. The latter finds that 94% of the total variance in the current equity return is attributable to the variance of innovations in dividends.

Table 4: Variance decomposition of excess returns

The table reports the decomposition of the variance in excess stock returns into the variances of revisions in expectations of dividends, real interest rates, and future excess returns as well as the covariances between these three components. The sample period ranges from January 1997 to December 2007. *** indicates significance at the 1 percent level. The standard errors are shown in parentheses and calculated using the Delta method, as in Campbell and Ammer (1993).

Variance component	Contribution to the total variance (%)
$Var(\tilde{e}^d)$	**0.86*** (0.07)**
$Var(\tilde{e}^i)$	**0.008*** (0.002)**
$Var(\tilde{e}^y)$	0.009 (0.01)
$-2cov(\tilde{e}^d, \tilde{e}^i)$	-0.008 (0.018)
$-2cov(\tilde{e}^d, \tilde{e}^y)$	**0.14** (0.067)**
$2cov(\tilde{e}^i, \tilde{e}^y)$	-0.01 (0.01)
$R^2(\tilde{e}^d)$	0.9
$R^2(\tilde{e}^i)$	$2\ E^{-4}$
$R^2(\tilde{e}^y)$	0.59

3.3 Explaining the reaction to macroeconomic news

To determine which factors explain the stock reaction to macroeconomic news, we use the three components calculated above (i.e., news about future excess returns $\tilde{e}_{t+1}^{y}$, news about future dividends $\tilde{e}_{t+1}^{d}$, and news about future real interest rates $\tilde{e}_{t+1}^{i}$). Using these components allows us to determine the sources of the reaction. Based on the estimates from equation (5), we define the error term as follows:

$$\omega_{t+1} = \sum_{j=1}^{11} {}_{j} S_{j,t+1} + \omega_{t+1}^{\perp}$$

The second equation of (6) can be written by dividing the error term into two components (macroeconomic surprises and other factors):

$$\tilde{e}_{t+1}^{y} = s_y \rho A (1 - \rho A)^{-1} \omega_{t+1} = s_y \rho A (1 - \rho A)^{-1} \left[\sum_{j=1}^{11} {}_{j} S_{j,t+1} + \omega_{t+1}^{\perp} \right] \quad (8)$$

Thus, one can define the response of the future excess returns component to the jth macroeconomic surprise as

$$s_y \rho A (1 - \rho A)^{-1}{}_{j} \quad (9)$$

Similarly, the third equation of (6) can be rewritten as follows:

$$\tilde{e}_{t+1}^{i} = s_i (1 - \rho A)^{-1} \omega_{t+1} = s_i (1 - \rho A)^{-1} \left[\sum_{j=1}^{11} {}_{j} S_{j,t+1} + \omega_{t+1}^{\perp} \right] \quad (10)$$

The response of the future interest rate component to the jth macroeconomic surprise is given by

$$s_i (1 - \rho A)^{-1}{}_{j} \quad (11)$$

Finally, the response of the future dividends component to the jth macroeconomic surprise is calculated as follows:

$$s_{yj} + s_y \rho A (1 - \rho A)^{-1}{}_{j} + s_i (1 - \rho A)^{-1}{}_{j} \quad (12)$$

Standard errors, which are corrected for autocorrelation and heteroskedasticity, are calculated using the Delta method, as in Campbell and Ammer (1993). The results of the estimation for each macroeconomic announcement are presented in table 5. According to the event study we conducted in section 3.1, only U.S. consumer confidence appears to impact excess stock returns. The decomposition

results (table 3) show that U.S. consumer confidence is the only announcement that simultaneously impacts the three components. An unanticipated increase in the U.S. consumer confidence indicator leads to an increase in future dividends, an increase in the future interest rate components and a decline in the risk premium component.

The study also finds that macroeconomic surprises cause revisions in the same direction for both the future dividends and future interest rate components. An unanticipated increase in CPI, household consumption, industrial production and consumer confidence causes an increase in both the future dividends and future interest rate components. The opposite effect is observed for the surprises related to the unemployment rate and housing starts. This result confirms our hypothesis that the lack of reaction is due to a simultaneous effect on two or three components of unanticipated excess returns.

Table 5: Impact of macroeconomic surprises on the components of unexpected excess returns

The table shows the results of the regression of future excess returns, future real interest rate and future dividends on the selected macroeconomic surprises. The regression is from January 1997 to December 2007. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Standard errors are shown in parentheses and are estimated using the Delta method.

Components / Announcements	$\tilde{e}^y$ News about *future excess returns*	$\tilde{e}^i$ News about interest rates	$\tilde{e}^d$ News about dividends
CPI	-1.3 E-4	**8.2 E-4 *** **	**1.6 E-3 *** **
	(1.0 E-4)	**(1.8 E-4)**	**(2.0 E-4)**
HCONS	1.3 E-4	5 E-5	**-1.2 E-3 *** **
	(1.1 E-4)	(1.6 E-4)	**(2.0 E-4)**
UNEMP	**1.4 E-4 ***	-4.0 E-5	**-1.2 E-3 *** **
	(8 E-5)	(1.1 E-4)	**(1.3 E-4)**
IP	1.6 E-5	**6.5 E-4 *** **	9 E-5
	(6.7 E-5)	**(1.1 E-4)**	(1.2 E-4)
CONF	3.2 E-4	**-2.0 E-3 *** **	**-3.7 E-3 *** **
	(2.2 E-4)	**(3.4 E-4)**	**(4.0 E-4)**
CPIUS	2.4 E-4	**-2.3 E-3 *** **	**-3.8 E-3 *** **
	(2.2 E-4)	**(3.7 E-4)**	**(4.3 E-4)**
UNEMPUS	5.3 E-5	**-1.1 E-3 *** **	**-1.4 E-3 *** **
	(1.1 E-4)	**(1.9 E-4)**	**(2.3 E-4)**
HCONUS	-1 E-4	**1.5 E-3 *** **	**1.9 E-3 *** **
	(1.5 E-4)	**(2.3 E-4)**	**(2.8 E-4)**
IPUS	-2 E-4	**2.2 E-3 *** **	**3.4 E-3 *** **
	(2.1 E-4)	**(3.6 E-4)**	**(4.1 E-4)**
CONFUS	**-2.4 E-4 ***	**3.4 E-4 *** **	**3.1 E-3 *** **
	(1.3 E-4)	**(1.4 E-4)**	**(1.9 E-4)**
HOUSING	2.3 E-4	**-3.6 E-3 *** **	**-3.6 E-3 *** **
	(3.3 E-4)	**(5.8 E-4)**	**(6.7 E-4)**

France: CPI: Consumer price index, **HCONS:** Household consumption, **UNEMP:** Unemployment rate, **IP:** Industrial production, **CONF:** Consumer confidence,
U.S.: CPIUS: Consumer price index, **HCONUS:** Household consumption, **UNEMPUS:** Unemployment rate, **IPUS:** Industrial production, **CONFUS:** Consumer confidence, **HOUSING:** Housing starts.

4. Conclusion

This paper presents a study on the impact of macroeconomic announcements on stock prices by using different approaches. The French market, represented by the CAC 40, is chosen to test the effects of both French and U.S. macroeconomic surprises on stock returns.

The first section documents the average response of stock returns to macroeconomic news. Previous studies have found little evidence regarding market reactions to those announcements. We test this result in the French stock market and demonstrate that surprises regarding U.S. inflation and real economic activity are particularly regarded by investors when valuing stock prices. This result confirms the important role of the U.S. economy in determining the development of the world economy.

The second section asks a more difficult question: how can we explain the stock market reaction? We made an attempt to provide a better insight in responding this question compared to previous studies on the subject. The results prove that insignificant effect shown by the event study methodology partly results from the simultaneous revision of future cash flows and future interest rates. This result confirms the findings of Mcqueen and Roley (1993) and provides a theoretical explanation to the stock market's lack of reaction to macroeconomic announcements, without dwelling on the causes related to estimation methods and data frequency, which previous studies have explored in depth and have failed to give any convincing answers. An interesting issue for future research on the topic can be the use of updated data to cover the recent crisis and to further advance our understanding of the relationship between the price discovery process and the macroeconomic announcements.

Appendix 1

Table 1: Descriptive statistics

Panel A: Descriptive statistics of the VAR variables

	e_t	i_t	$\Delta y_{1,t}$	Δp_t	Δdy_t
Mean	0.0004	0.0014	0.0002	0.0004	0.0002
Std Error	0.014	0.0024	0.0168	0.0203	0.018
Maximum	0.072	0.007	0.205	0.47	0.204
Minimum	-0.074	-0.004	-0.174	-0.161	-0.338
Skewness	-0.025	0.08	1.3	4.48	-1.035
Kurtosis	5.6	2.5	37.1	114.9	60.1
Jarque-Bera	783.6 *	27.6 *	136 E^3 *	146 E^4 *	379 E^3 *

*: Significant at the 1% level
$\boldsymbol{e_t}$: CAC 40 excess returns, $\boldsymbol{i_t}$: real interest rate, $\Delta \boldsymbol{y_{1,t}}$: change in nominal interest rate, $\Delta \boldsymbol{p_t}$: change in risk premium, $\Delta \boldsymbol{dy_t}$: dividend yield

Panel B: Descriptive statistics of macroeconomic announcements (in percentage)

	CPI	HCONS	UNEMP	IP	CONF	CPIUS	HCONUS	UNEMPUS	IPUS	CONFUS	HOUSING
Observations	132	132	128	132	132	132	132	132	132	132	132
Time	7H30	8H45	7H30	8H45	8H45	14H30	14H30	14H30	15H15	16H	14H30
Mean	-0.24	0.06	-0.32	-0.12	0.78	-0.16	0.30	-0.36	0.10	0.13	0.18
Std error	1.01	1.04	1.00	1.00	1.07	0.90	1.00	1.00	1.00	1.00	0.87
Maximum	3.19	2.06	2.42	3.46	3.09	2.26	3.49	2.56	3.20	2.76	2.21
Minimum	-4.25	-3.49	-3.62	-3.10	-6.81	-2.26	-2.71	-2.56	-2.46	-2.46	-2.09

France: CPI: Consumer price index, **HCONS:** Household consumption, **UNEMP:** Unemployment rate, **IP:** Industrial production, **CONF:** Consumer confidence,
U.S.: CPIUS: Consumer price index, **HCONUS:** Household consumption, **UNEMPUS:** Unemployment rate, **IPUS:** Industrial production, **CONFUS:** Consumer confidence, **HOUSING:** Housing starts.

Appendix 2

This appendix briefly sketches the derivation of the log-linearized relationship between the current excess return, expected future excess returns, dividend growth, and real interest rates given in equation (2), as in Campbell and Shiller (1988) and Campbell (1991).

The starting point is the definition of the stock return H_{t+1}:

$$1 + H_{t+1} = \frac{P_{t+1}+D_{t+1}}{P_t} \tag{A1}$$

Here, P is the stock price, and D is the dividend. We take the logs and allow

$$h_{t+1} \equiv \ln(1 + H_{t+1}) = \ln(P_{t+1} + D_{t+1}) - \ln(P_t) \tag{A2}$$

The next step is to derive a log-linear approximation of $\ln(P_{t+1} + D_{t+1})$. We can derive this approximation by first differencing and expressing the change in the log of the sum as the weighted sum of the log differences:

$$\Delta\ln(P_{t+1} + D_{t+1}) \approx \rho\Delta p_{t+1} + (1 - \rho)\Delta d_{t+1} \tag{A3}$$

where ρ is the discount factor which is approximated by $\rho = \frac{1}{1+\exp(\ln(\delta))}$; δ is the dividend yield measured in percentage points per year. Calculating the integral of (A3), we find

$$\ln(P_{t+1} + D_{t+1}) \approx k + \rho p_{t+1} + (1 - \rho)d_{t+1} \tag{A4}$$

Substituting this value into equation (A2), substituting δ_t for $d_{t-1} - p_t$, and combining the terms gives

$$h_{t+1} \approx k + \rho p_{t+1} + (1 - \rho)d_{t+1} - p_t \tag{A5}$$

Imposing the terminal condition that $\lim_{j\to\infty}\rho^j E_t(p_{t+j}) = 0$ equation (A5) can be solved forward to give:

$$p_t = \frac{k}{1-\rho} + E_t\left[\sum_{j=0}^{\infty} \rho^j \left[(1-\rho)d_{t+j+1} - h_{t+j+1}\right]\right] \quad \text{(A6)}$$

By substituting p_t and p_{t+1} out of equation (A5), Campbell (1991) shows that a decomposition of the unexpected stock return can be obtained as

$$\tilde{h}_{t+1} \equiv h_{t+1} - E_t(h_{t+1}) = (E_{t+1} - E_t)\left[\sum_{j=0}^{\infty} \rho^j \Delta d_{t+j+1} - \sum_{j=1}^{\infty} \rho^j h_{t+j+1}\right] \quad \text{(A7)}$$

The excess stock return over a short term interest rate can also be defined as $e_{t+1} \equiv h_{t+1} - i_{t+1}$, where h_{t+1} is the expected return, and i_{t+1} is the real interest rate. As a result, the unexpected excess return can be written as

$$e_{t+1}^{y} = (E_{t+1} - E_t)\left[\sum_{j=0}^{\infty} \rho^j \Delta d_{t+j+1} - \sum_{j=0}^{\infty} \rho^j i_{t+j+1} - \sum_{j=0}^{\infty} \rho^j e_{t+j+1}\right] \quad \text{(A8)}$$

or

$$e_{t+1}^{y} = \tilde{e}_{t+1}^{d} - \tilde{e}_{t+1}^{i} - \tilde{e}_{t+1}^{y} \quad \text{(A9)}$$

This equation indicates that the unexpected excess return e_{t+1}^{y} is equal to the news about future dividends $\tilde{e}_{t+1}^{d}$, minus news about future real interest rates $\tilde{e}_{t+1}^{i}$and news about future excess returns $\tilde{e}_{t+1}^{y}$.

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