US STOCK MARKET: INFLATION NEWS IMPACT

Mª del Camino Torrecillas Muelas

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Master en Banca y Finanzas Cuantitativas

Tutor: Dr. Francisco Jareño Cebrián

Universidad Complutense de Madrid

Universidad del País Vasco

Universidad de Valencia

Universidad de Castilla-La Mancha

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Contents

Abstract

This study is focused on measuring the inflation news impact on common stock returns. Using CPI and PPI announcements and daily returns of S&P500 Index, we make a sectoral analysis around the announcement day by Event Study Methodology. Our period of study is from January 1990 until April 2013. Taking into account the direction of the inflation news and the state of the economy, we can affirm that the sectoral returns react strong to CPI announcements and do not react to PPI announcements. Moreover, the majority of the significant responses occur two days after that the inflation announcement takes place. This conclusion is related with market efficiency. We can affirm that investors respond later to the arrival of new information.

1 Introduction and literature Review

Over the years, many authors have been concerned with measuring the effect of macroeconomic announcements on financial markets. The interest in this topic lies to be able to determine if public macroeconomic information moves asset prices. The literature documents a heterogeneous response to these announcements. Some news have a strong impact on asset prices and others do not. Economic theory affirms that announcement surprises cause conditional mean jumps in asset prices.[1] Beechey and Wright (2009) divide macroeconomic announcements in three groups: news about prices, news about the real side of the economy and news about monetary policy. The authors find empirical evidence that each news has a different impact on financial markets. Moreover, this effect depends on the other factors such as the state of the economy, the direction of the news, the characteristics of each asset, etc. and, also, other public and private information.

Our analysis focuses on analyzing the inflation news impact (Producer Price Index (PPI) and Consumer Price Index (CPI)) on common stock returns (S&P500 index),[2] but we think that it is necessary to have a general knowledge about the impact of all macroeconomic announcements. Thus, in this section, we carry out a brief compilation of some previous studies about this topic.

There is large literature which tries to explain the relationship between expected inflation, unexpected inflation and changes in inflation rate and stock returns, and the authors have obtained results very controversial. Firstly, the Classical Fisher model (1930) notes that the nominal interest rate can be separated in the sum of two components: the expected real rate and the expected inflation rate. He argues that the expected real return is determined by real factors and, therefore, both rates have to be statistically uncorrelated. Hence, from a traditional point of view, equities shares should be used as a hedge against inflation. The following researches show a negative relationship between expected inflation rate and common stock returns using Post – War data for US and other industrialized countries. These studies question the Fisher hypothesis in which nominal asset returns move one-for-one with inflation rate. A valuable paper of Fama and Schwert (1977) analyzes if assets were hedges against the expected and unexpected inflation rate during the 1953-1971 period in US. They determine that this hedge depends on the characteristics of each asset. The authors find a negative relationship between common stock returns and expected and unexpected inflation rate and thereby, they conclude that common stock returns are not a good hedge against inflation. Later, Fama (1981) and Geske and Roll (1983) argue that this negative relationship is due to a positive relationship between stock returns and future economic activity. In this manner, inflation acts as a 'proxy' for expected real activity.

[1] There is a lot empirical evidence which corroborate this theory: Beechey and Wright (2009), Andersen *et al*. (2007), Evans (2011) and Miao *et al* (2013).

[2] Gilbert (2011) presents evidence that daily returns of the Standard & Poor's 500 index (S&P500) and revisions of inflation rate are positively related in expansion and negatively related in recession periods.

Therefore, the relationship is weak because is spurious. This theory is known as "Proxy Hypothesis".[3] Some years later, other authors try to find evidence which can corroborate this theory. Stulz (1986) provides an equilibrium model in which expected real stock returns are negatively related with expected inflation and money growth. This model agrees with Fama and Geske and Roll's hypothesis. Balduzzi (1994) concludes that inflation and stock returns have a strong correlation when the inflation rate is the variable that suffers the shock. Moreover, he also takes into account the effect of inflation and stock returns on nominal interest rate. More recently, Gallagher and Taylor (2002) develop a theoretical model to prove the "Proxy hypothesis". They find strong evidence in US data to confirm this hypothesis: real stock returns are not significantly related with inflation due purely to demand innovations, but they are strongly negatively correlated with inflation due to supply innovations. Other important model related with "Proxy Hypothesis" is the Fed model.[4] This model regards that the Proxy Hypothesis is true because an important part of US data shows the existence of stagflation. Contrarily, Pérez de Gracia and Cuñado (1999) analyze the relationship between inflation and common stock returns during the 1941-1999 period in Spain, corroborating the existence of Granger causality relationship between inflation and stock returns and, therefore, they disagree with Geske and Roll and Fama: this relationship cannot be spurious. Kaul (1986) explains that the relationship between inflation and stock returns varies over the time in a systematic way. He determines that this relationship is caused by money demand and supply factors.

Other studies analyze the relationship between common stock returns and inflation rate for a much longer period. For example, Jaffe and Mandelker (1976) find a negative relationship between common stock returns and inflation rate over short sample periods, but this relationship becomes positive when the authors consider a long period 1875-1970. This positive long-run inflation effect is corroborated by Boudoukh and Richardson (1993), who study the relationship between stock returns and inflation rate in US and UK stock markets during 1802-1990. Anari and Kolari (2001) analyze the stock prices response to changes in inflation rate in six different countries.[5] They find a negative response at short horizons, but a positive and permanent relationship at long horizons in all cases. They believe that common stock returns are a good hedge against inflation over a large period because stock prices have a long memory for inflation shocks. An important paper of Adams *et al*. (1999) examines the relationship between inflation news and stock returns through the response (in minutes and trades) of size-based stock portfolios to the news published in scheduled (PPI and CPI). They conclude that the market response is strong for PPI news and weak for CPI news. The

[3] The "Proxy Hypothesis" is based in two stylized facts. Firstly, a rise of inflation rate anticipates a low growth rate of real economic activity, and secondly, high stock returns anticipate a high growth rate of real economic activity. In conclusion, the inflation and the common stock returns move in opposite directions.

[4] An explanation of the Fed model can be found in the paper of Campbell and Vuolteenaho (2004) and Bekaert and Engstrom (2010). This model affirms the existence of a positive correlation between equity yields and bonds with expected inflation.

[5] The industrialized countries which have been analyzed by Anari and Kolari (2001) are United States, Canada, United Kingdom, France, Germany and Japan from 1953 until 1998.

negative relationship is strong for large portfolios and insignificant for small portfolios. Therefore, the market response to macroeconomic news depends on the type of the announcement and the size of the portfolio. Bajo and Esteve (1998) confirm the existence of a partial long term Fisher effect in Spanish market during the 1962-1996.[6] Ferrer (2000), also in Spanish market, uses cointegration techniques and VAR models, and he concludes that the relationship between inflation and stock returns is negative and permanent.

Other authors attempt to explain the relationship between unexpected inflation and common stock returns from two different points of view. Firstly, Estep and Hanson (1980) propose that this relationship could be neutral because the companies can transfer the increases of inflation to the prices of their products.[7] This theory is known as "Flow – Through" hypothesis (Jareño, 2005, and Jareño and Navarro, 2010). They conclude that the companies with a higher flow – through ability are less affected by changes in inflation rate. Therefore, the negative effect of a rise in inflation on a firm is inversely related with its flow – through ability. Secondly, other alternative explanation is the theoretical "Rational Expectations Equilibrium Model" of assets prices of Veronesi (1999). He concludes that stock prices overreact to bad news when the state of the economy is good and underreact to good news when the state of the economy is bad. It occurs because when the announcements go against the market tendency, the investor's uncertainty increases and, therefore, the volatility of the market also increase. On the other hand, a recent paper of Linfang *et al.* (2010) suggests that the relationship between inflation and stock returns varies depending on the economy goes through high or low inflation periods. Díaz and Jareño (2009 and 2013) deal to explain the impact of inflation news on stock prices taking into account, on one hand, the Veronesi's hypothesis and, on the other hand, the Estep and Hanson's "flow – through hypothesis". Firstly, they analyze the short run response of each sector of Spanish economy to unanticipated component of inflation announcements, and secondly, they study the potential explanatory factors of each response. They observe different reactions to unexpected inflation depending on the direction of the news and the state of the economy. They obtain evidence that the positive surprises ("bad news") affect in more sectors than the negative surprises ("good news") and, moreover, the reaction of investors is stronger when the news are bad than when the news are good (as suggested by Veronesi). [8]

Finally, some authors such as Oxman (2012) suggest that the relationship between inflation rate and stock returns depends on the measure of inflation it has

[6] Jareño and Tolentino (2012b) find similar results also in the Spanish market.
[7] Asikoglu and Ercan (1992) investigate the relationship between inflation and stock prices in US industry using the Estep and Hanson's "flow – through" hypothesis. They observe that each sector reacts in a different way to changes in unexpected inflation.
[8] Other related papers are Jareño (2007) and Jareño (2009).

utilized. He concludes that all measures of inflation are positively and significantly related with risk premium but not with excess returns.[9]

To conclude, we can highlight that the majority of the authors find a negative relationship between stock returns and inflation in the short term, but this relationship becomes positive in the long term. In consequence, the Fisher effect only happens in a partial form and in the long term. Therefore, we can suppose that an inflationist shock can cause a change in nominal interest rates. On the other hand and following the models described by Estep and Hanson and Veronesi, we can conclude that the mentioned relationship can be explained taking into account indicators such as the flow–through ability of the companies, the state of the economy and the direction of inflation surprises.

Event study methodology

Our study is in the context of "Event Study" methodology.[10] Event Study enables us to gauge the effects of a particular event on stock returns. The aim of this methodology is to analyze the market response to the arrival of macroeconomics news (in our case, unexpected inflation news) through the observation of abnormal returns around the event day. We expected that the returns to be different due to the event. Moreover, this methodology allows us to measure the market efficiency (in the sense that prices fully reflect available information). The "Market Efficiency" hypothesis affirms that the announcement has an unexpected component which can mean the arrival of new relevant information to the market. Only this unexpected component of the announcement should have impact on the market. Therefore, if the market is efficient, an inflationary shock has to cause an immediate response in the prices of equities. Contrarily, if the abnormal returns persist after the event occurs, or the market reacts before the event takes place, it means that the market is inefficient. Hence, the concept of market efficiency is crucial for finance because it allows us to study how public information about macroeconomic events affects to financial markets. Understanding the determinants of assets prices and how the markets process the arrival of new information is essential in order to improve the market mechanism.

A wide number of empirical studies get evidence that the fitting of the stock prices to announcements of macroeconomics news depends on the economic sector, the size of assets, the state of the economy, the direction of the news, etc. Cenesizoglu (2011) analyzes the reaction of daily stock returns on portfolios with different characteristics (size and book to market ratio) to macroeconomic news about a great range of variables. He gets evidence that returns of different portfolios react differently

[9] Tessaromatis (2003) studies the sensitivity of stock market to interest rate and inflation and he does not find a significant relationship between sectoral returns and changes in inflation rate (Jareño, 2006). Pearce and Roley (1985) do not find a significant relationship between CPI announcements and stock prices.

[10] An explanation of Event Study methodology can be found in papers written by Peterson (1989), Kritzman (1994) and Mackinlay (1997).

to the same news. Moreover, he also takes into account the business cycle. His results are very consistent with McQueen and Roley (1993), Boyd *et al.* (2005) and Andersen *et al*. (2007). A famous paper of Brown and Warner (1985) examine the properties of daily stock returns and how these data affect in Event Study methodology for calculating the share price impact of firm–specific events. Flannery and Protopapadakis (2002) use 17 macro announcement series from 1980 to 1996 and estimate a GARCH model of daily equity returns. We find six candidates for priced factors: three nominal (CPI, PPI, and a Monetary Aggregate) and three real (Balance of Trade, Employment Report, and Housing Starts). Pearce and Roley (1985) use survey data to measure expectations and they discovery that daily stock prices respond to monetary information between September 1977 and October 1982, but news about Consumer Price Index (CPI), unemployment and industrial production have no significant effects on prices. Hardouvelis (1987) finds out that stock prices respond primarily to monetary news. McQueen and Roley (1993) evaluate the effect of real activity news on proxies for expected cash flows and equities discount rates. They suggest that when the economy is strong the stock market responds negatively to news about higher real economic activity. In this line, Andersen *et al.* (2002) examine that announcement surprises (difference between expected value and current value) produce conditional mean jumps on returns. The authors conclude that bad news have greater impact than good news, and therefore, the market reacts to news in an asymmetric way (as suggested by Boyd *et al*. (2002) for unemployment news).[11] Knif *et al.* (2008) stand out the importance of distinguishing between good and bad news if we want to be able to understand how inflation affects to stock returns. They conclude that the effect of positive or negative inflation shocks can be different depends on the state of the economy. Therefore, the market reaction should not be the same in all cases. This reaction may depend on if investors perceive these shocks as positive or negative. Culter *et al.* (1989) use autoregressions vector to measure news about macroeconomic time series from 1971 until 1986. They conclude that less than one-third of the monthly return variance can be explained from these sources.

There are also studies which aim goal is to measure the market efficiency.[12] For example, Joyce and Read (1999) examine the same – day reaction of a variety of UK asset prices to monthly Retail Price Index (RPI) announcements over a sample period extending from the early 1980s until April 1997. They confirm that markets are efficient in the sense that asset prices do not respond to the expected component of these announcements. Jones *et al.* (1998) examine the reaction of daily bond returns to the release of macroeconomic news (in particular, PPI and unemployment announcements).

[11] Bestelmeyer and Hess (2010) show the stock price response on firm level to unemployment news. They bear in mind the state dependence and the effect of cyclicality. They obtain evidence that the exposure of a company to the business cycle determines its sensitivity to macroeconomic news.

On the other hand, an original paper of Birz and Lott Jr (2011) studies the influence of newspaper stories of stock returns. Theirs findings indicate that news about GDP and unemployment does affect stock returns.

[12] Other papers related with "Market Efficient" hypothesis are Dimson and Mussavian (1998) and Jareño (2009).

They conclude that these announcements do affect the market; nonetheless, the public information is incorporated quickly into prices.

In conclusion, each of these studies analyzes the stock market response to macroeconomic news. We can deduce two general conclusions. The first conclusion is about how the returns adjust to the arrival of new information. The authors conclude that the fitting of returns depends on the state of the economy (expansion or recession) and the direction of the news (positive or negative news). In particular, they obtain evidence about the fact that news of higher than expected real activity, when the economy is already strong, results in lower stock prices, whereas the same event, in a weak economy, is associated with higher stock prices. Moreover, the investors' response is different due to the direction of the market. Hence, identical economic events can cause different effect in the market depend on the context which take place. The second conclusion is related with market efficiency. In the bulk of the cases, the results obtained by the authors are consistent with this theory.

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 explains the methodology that we have used to calculate the unexpected component of inflation rate, the state of the economy and the abnormal returns. Section 4 shows the model specification and the results. Finally, the last section includes a summary and concluding remarks.

2 Data

We are going to analyze the inflation news impact on U.S. stock market between January 1990 and April 2013. We work with monthly announcements of CPI (U.S. Consumer Price Index, all items) and PPI (U.S. Producer Price Index, all finished goods) seasonally-adjusted data and the exact date of each announcement. The value of both variables is announced by U.S. Bureau of Labor Statistics each month. In all, we have 280 monthly announcements.

The U.S. Consumer Price Index (CPI) is a measure of the average change in prices over time of goods and services purchased by households, according to the Laspeyres formula. [13]

We need to get rid of the seasonal component of the CPI and PPI series, thus, we calculate a year-to-year inflation rate through the following equation:

$$\pi_t = \frac{CPI_t - CPI_{t-12}}{CPI_{t-12}} \qquad (1) \qquad\qquad \pi_t = \frac{PPI_t - PPI_{t-12}}{PPI_{t-12}} \qquad (2)$$

where CPI_t is the Consumer Price Index at time t and PPI_t is the Producer Price Index at time t.

[13] More detailed information about CPI can be found in www.bls.gov.

Firstly, we make a previous analysis of the series. We study if CPI and PPI are stationary. We show the inflation rate graph (figure 1) and the classical test (Augmented Dickey-Fuller (ADF), Dickey-Fuller (DF), Phillips-Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS)). These unit root test corroborate that CPI and PPI are not stationary in mean, I(1), but they are stationary in variance (table 1).

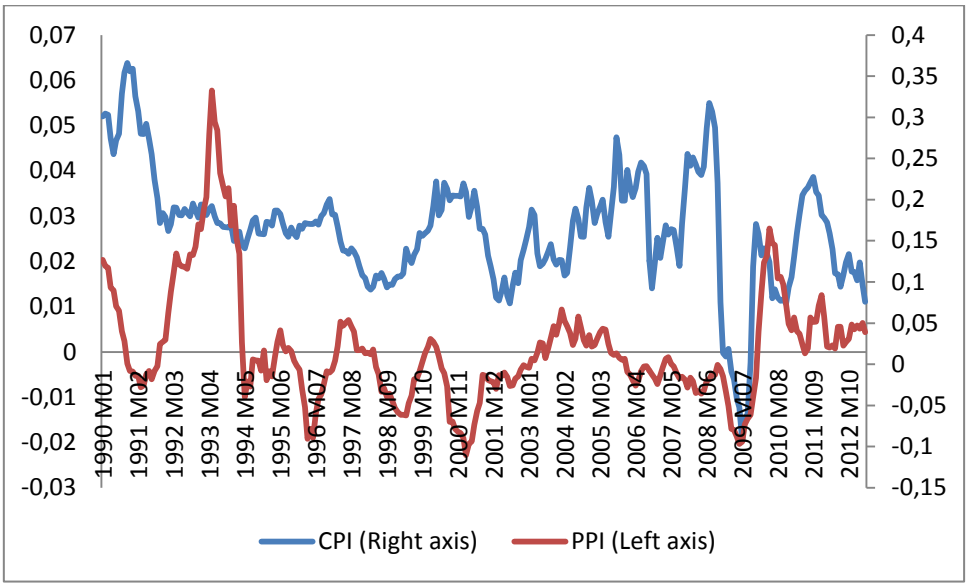

Fig.1. Inflation rates

Table 1

Unit root and stationarity test of CPI and PPI

This table shows the Augmented Dickey-Fuller (ADF), Dickey-Fuller (DF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests.
[a] p<0.1, [b] p<0.05, [c] p<0.01 MacKinon (1996) one –side p-values.

	CPI		PPI	
Test	**t-statistic**		**t-statistic**	
ADF	-3.179376	-3.454719[c] -2.872162[b] -2.572503[a]	-2.430696	-3.454812[c] -2.872203[b] -2.572525[a]
DF	-3.017010	-3.453652[c] -2.871693[b] -2.572253[a]	-2.418502	-3.453652[c] -2.871693[b] -2.572253[a]
PP	-3.602478	-3.453652[c] -2.871693[b] -2.572253[a]	-3.289203	-3.453652[c] -2.871693[b] -2.572253[a]
KPSS	0.472750	0.739000[c] 0.463000[b] 0.347000[a]	0.295847	0.739000[c] 0.463000[b] 0.347000[a]

Moreover, we also need daily close-to-close returns of ten sectors which make up the S&P 500 and the index. The continuously compounded returns are calculated as:

$$R_{i,t} = log\left(P_{i,t}/P_{i,t-1}\right) \qquad (3)$$

where $P_{i,t}$ represents the price level on sector i at time t.

We work with daily data because they make able us to differentiate the CPI and PPI announcements from others macroeconomics news.[14]

Table 2 show "The Global Industry Classification Standard" (GICS). This classification was developed by Morgan Stanley Capital International (MSCI) and Standard &Poor's (S&P). This classification aims to enhance the investment research and asset management process for financial professionals worldwide. They are the result of numerous discussions with asset owners, portfolio managers and investment analysts and are designed to respond to the global financial community's need for an accurate, complete and standard industry definition.

Table 2

The Global Industry Classification Standard (GICS).

Sector name	**Subsectors**
Sector 1: Energy (S5ENRS)	1.1.- Energy
Sector 2: Materials (S5MATR)	2.1.- Materials
Sector 3: Industrials (S5INDU)	3.1.- Capital Goods 3.2.- Commercial Services & Supplies 3.3.- Transportation
Sector 4: Consumer Discretionary (S5COND)	4.1.- Automobiles & Components 4.2.- Consumer Durables & Apparel 4.3.- Hotels, Restaurants & Leisure 4.4.- Media 4.5.- Retailing
Sector 5: Consumer Staples (S5CONS)	5.1.- Food & Drug Retailing 5.2.- Food, Beverage & Tobacco 5.3.- Household & Personal Products
Sector 6: Health Care (S5HLTH)	6.1.- Health Care Equipment 6.2.- Pharmaceuticals & Biotechnology
Sector 7: Financials (S5FINL)	7.1.- Banks 7.2.- Diversified financials 7.3.- Insurance 7.4.- Real Estate
Sector 8: Information Technology (S5INFT)	8.1.- Software & Services 8.2.- Technology Hardware & Equipment
Sector 9: Telecommunication Services (S5TELS)	9.1.- Telecommunication Services
Sector 10: Utilities (S5UTIL)	10.1.- Utilities

[14] Working with daily data instead of monthly data has more advantages: McQueen and Roley (1993) and Flannery and Protopapadakis (2002).

Below, we show in Table 3 the summary statistics of daily returns of S&P500 Index. We can observe that mean and median returns for all sectors are virtually zero. The test of hypothesis that mean is equal to zero only can be rejected for Consumer Discretionary, Consumer Staples and Health Care. However, the same test for the median shows that we have to reject the null hypothesis in all cases except Telecommunication Services. The most volatile sector is Financials, followed by Information Technology.

Table 3

Summary statistics of daily returns S&P500

This table reports summary statistics for daily returns on the sectors and S&P500. Sd is the standard deviation, Sk is the skewness and Kt is the kurtosis. [a] p<0.1, [b] p<0.05, [c] p<0.01

	Mean	Median	Max.	Min	Sd.	Sk.	Kt.	N.
S5ENRS	0.000313	0.000436[c]	0.169604	-0.168836	0.015226	-0.269530	14.42801	5878
S5MATR	0.000193	0.000376[b]	0.124730	-0.129339	0.014480	-0.230226	10.01571	5878
S5INDU	0.000262	0.000464[c]	0.09516	-0.095987	0.012786	-0.319494	8.942829	5878
S5COND	0.000302[a]	0.000597[c]	0.123131	-0.103269	0.013369	-0.091337	9.828812	5878
S5CONS	0.000324[b]	0.000470[c]	0.088353	-0.092961	0.009771	-0.092953	10.40693	5878
S5HLTH	0.000342[b]	0.000552[c]	0.117131	-0.091733	0.012101	-0.111985	8.420584	5878
S5FINL	0.000201	0.000382	0.172013	-0.186390	0.018404	-0.084645	18.66075	5878
S5INFT	0.000337	0.000987[c]	0.160769	-0.100077	0.017794	0.139888	7.597963	5878
S5TELS	0.000086	0.000160	0.129261	-0.103203	0.013794	0.060425	9.637573	5878
S5UTIL	0.000119	0.000450[c]	0.126840	-0.089962	0.011073	-0.011728	14.17923	5878
S&P500	0.000254[a]	0.000533[c]	0.109572	-0.094695	0.011669	-0.231326	11.51191	5878

3 Methodology

3.1 Estimation of the unexpected inflation component

There are a large number of methodologies that it helps us to obtain the unexpected inflation component. A great number of studies (e.g., Schwert, 1981; Joyce and Read, 2002; Díaz and Jareño, 2009) use simple time series models (ARIMA models) in order to estimate the expected inflation component. In this methodology, it is assumed that the expected inflation component depends on own past of the series.

Other authors use short-term interest rates as predictors of inflation rate (e.g., Schwert, 1981; Asikoglu and Ercan, 1992). Recently studies use government inflation indexed-bonds (Tessaromatis, 2003).

We utilize the *naïve* model as a simple form to estimate the expected inflation rate (Leiser and Drori, 2005; Jareño, 2006, 2009; Ariño and Canela, 2002). This model is based on the best forecast of inflation for current month is the value of the last month. The unexpected inflation component (π_t^u) is calculated as the difference between the observed total inflation rate (π_t) and the expected inflation component(π_t^e).

$$\pi_t^u = \pi_t - \pi_t^e \qquad (4)$$

Table 4 shows the main statistics of total, expected, unexpected and total inflation rate of CPI and PPI.

Table 4

Main statistics of total, expected and unexpected CPI and PPI

This table reports summary statistics for CPI and PPI announcements and its expected and unexpected components. CPIE and PPIE are the expected component of CPI and PPI and CPIU and PPIU are the unexpected component.

	CPI	CPIE	CPIU	PPI	PPIE	PPIU
Mean	0.026990	0.027136	-0.000147	0.019972	0.020288	-0.000316
Median	0.027575	0.027640	-8.16E-05	0.006783	0.006783	-0.001088
Maximum	0.063796	0.063796	0.021186	0.332673	0.332673	0.076483
Minimun	-0.019615	-0.019615	-0.026311	-0.110459	-0.110459	-0.107914
Std. dev.	0.012524	0.012577	0.004172	0.070307	0.070589	0.018104
Skewness	-0.218658	-0.215401	-0.641378	1.445961	1.427723	-0.547094
Kurtosis	4.988841	4.962611	11.62673	6.144408	6.040004	8.861886
Observations	279	279	279	279	279	279

Figure 2.A. and 2.B. show the series of expected and unexpected component of CPI and PPI calculate by *naïve* model, respectively. The graphs and the tables 5.A. and 5.B corroborate that the expected component of CPI and PPI (CPIE and PPIE) is not stationary in mean, I(1), but they are stationary in variance; nevertheless, the unexpected component of CPI and PPI (CPIU and PPIU) are stationary.

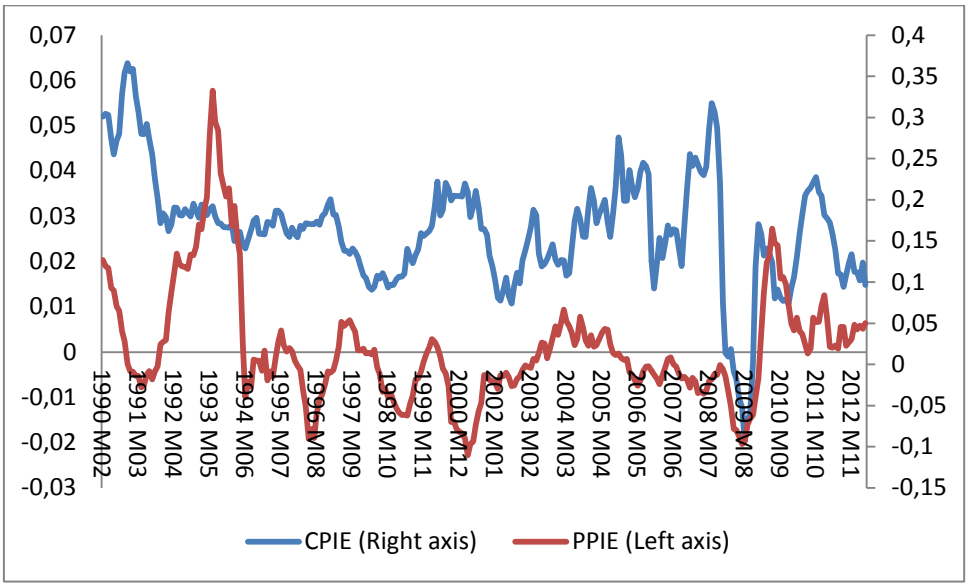

Fig.2.A Expected component of CPI and PPI

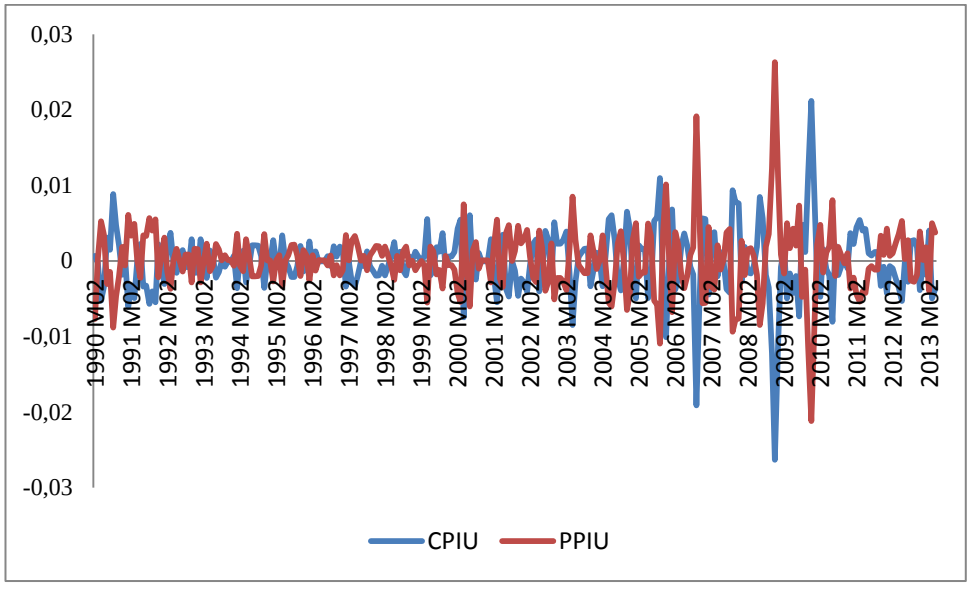

Fig.2.B. Unexpected component of CPI and PPI

Table 5

Unit root and stationarity test

Table 5.A. Unit root and stationarity test of CPI, CPIE and CPIU

This table shows the Augmented Dickey-Fuller (ADF), Dickey-Fuller (DF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. [a] p<0.1, [b] p<0.05, [c] p<0.01 MacKinon (1996) one –side p-values.

	CPI		CPIE		CPIU	
Test	t-statistic		t-statistic		t-statistic	
ADF	-3.229362	-3.454812 -2.872203 -2.572525	-3.236943	-3.454812 -2.872203 -2.572525	-9.849593	-3.454719 -2.872162 -2.572503
DF	-3.057902	-3.453737 -2.871731 -2.572273	-3.074518	-3.453737 -2.871731 -2.572273	-11.06613	-3.453737 -2.871731 -2.572273
PP	-3.643714	-3.453737 -2.871731 -2.572273	-3.683148	-3.453737 -2.871731 -2.572273	-10.17479	-3.453737 -2.871731 -2.572273
KPSS	0.456269	0.739000 0.463000 0.347000	0.463102	0.739000 0.463000 0.347000	0.028743	0.739000 0.463000 0.347000

Table 5.B. Unit root and stationarity test of PPI, PPIE and PPIU

This table shows the Augmented Dickey-Fuller (ADF), Dickey-Fuller (DF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. [a] p<0.1, [b] p<0.05, [c] p<0.01 MacKinon (1996) one –side p-values.

	PPI		PPIE		PPIU	
Test	**t-statistic**		**t-statistic**		**t-statistic**	
ADF	-2.393561	-3.454906[c] -2.872244[b] -2.572547[a]	-2.418677	-3.454906[c] -2.872244[b] -2.572547[a]	-6.136464	-3.454812[c] -2.872203[b] -2.572525[a]
DF	-2.386890	-3.453737[c] -2.871731[b] -2.572273[a]	-2.400985	-3.453737[c] -2.871731[b] -2.572273[a]	-12.12582	-3.453737[c] -2.871731[b] -2.572273[a]
PP	-3.268745	-3.453737[c] -2.871731[b] -2.572273[a]	-3.305411	-3.453737[c] -2.871731[b] -2.572273[a]	-12.27887	-3.453737[c] -2.871731[b] -2.572273[a]
KPSS	0.284820	0.739000[c] 0.463000[b] 0.347000[a]	0.297885	0.739000[c] 0.463000[b] 0.347000[a]	0.047420	0.739000[c] 0.463000[b] 0.347000[a]

In order to validate the *naïve* model, we calculate an unbiased test which consists of a regression between annual inflation rate and annual expected inflation rate.

If the proposal measure for the expected inflation rate is really an unbiased forecast of the inflation rate which have existed in the economy, we hope that α=0 and β=1 and the error terms are not correlated. Table 6 shows this test. The results are clearer for CPI than PPI, but the Wald Test allow us to affirm that PPIE also is an unbiased estimator for expected component of PPI.

Table 6

Unbiased test

This table reports the regression model estimated by Least Squares (OLS) by annual data from 1972 to 2010 for CPI and from 1962 to 2012 for PPI:

$$\pi_t = \alpha + \beta E_{t-12}(\pi_t) + u_t \qquad (5)$$

where π_t is the annual inflation rate, $E_{t-12}(\pi_t)$ is the annual expected inflation rate and u_t error term. Wald test allow us to check the joint hypothesis α=0 and β=1, showing the value of *F statistical.*

	Intercept	Beta	Adj R^2	Wald Test
Modelo *Naïve* CPI	0.008331 (1.527712)	0.802588 (7.945457)	0.620494	1.929050
Modelo *Naïve* PPI	0.015340 (2.540041)	0.577122 (5.008283)	0.325080	6.737239

3.2 State of the economy

Following the papers of authors such as Veronesi (1999), Knif *et al.* (2008) and Díaz and Jareño (2009 and 2013) between other, we want to test the hypothesis that the stock market response to unexpected inflation rate depends on the business cycle. To do so, we need to classify the state of the economy. We utilize the National Bureau of Economic Research (NBER's) classification, but only it is available until June 2009. Therefore, we also apply McQueen and Roley's (1993) methodology to identify expansion and recession months. In this way, we can corroborate the robustness of our analysis with two different classifications.

McQueen and Roley's methodology has been widely used in literature.[15] It utilizes the seasonally adjusted monthly Industrial Production Index (IPI) in order to define economic states. Firstly, we estimate a trend in the log of the IPI. We regress the log of the IPI on a constant and a time trend (Table 7).

[15] McQueen and Roley (1993), Adams *et al* (1999), Díaz and Jareño (2009, 2013).

Table 7

McQueen and Roley's methodology

This table reports the regression model estimated by Least Squares (OLS) by monthly data of IPI from January 1990 to April 2013:

$$Ln(IPI_t) = \alpha + \beta trend_t + u_t \quad (6)$$

Intercept	Beta	Adj R^2
4.161247	0.008931	0.789146
(465.9472)	(32.32945)	

Secondly, we choose the constant λ=0.0285 so that while the log of IPI is above the upper bond, the economic activity is high, and when the log of IPI is below the lower bond, the economic activity is low. Medium activity is represented when the log of IPI is between bounds (figure 3). The annual rate of GDP (figure 4) confirms the robustness of this analysis. We can observe the existence of an important parallelism between IPI and GDP.

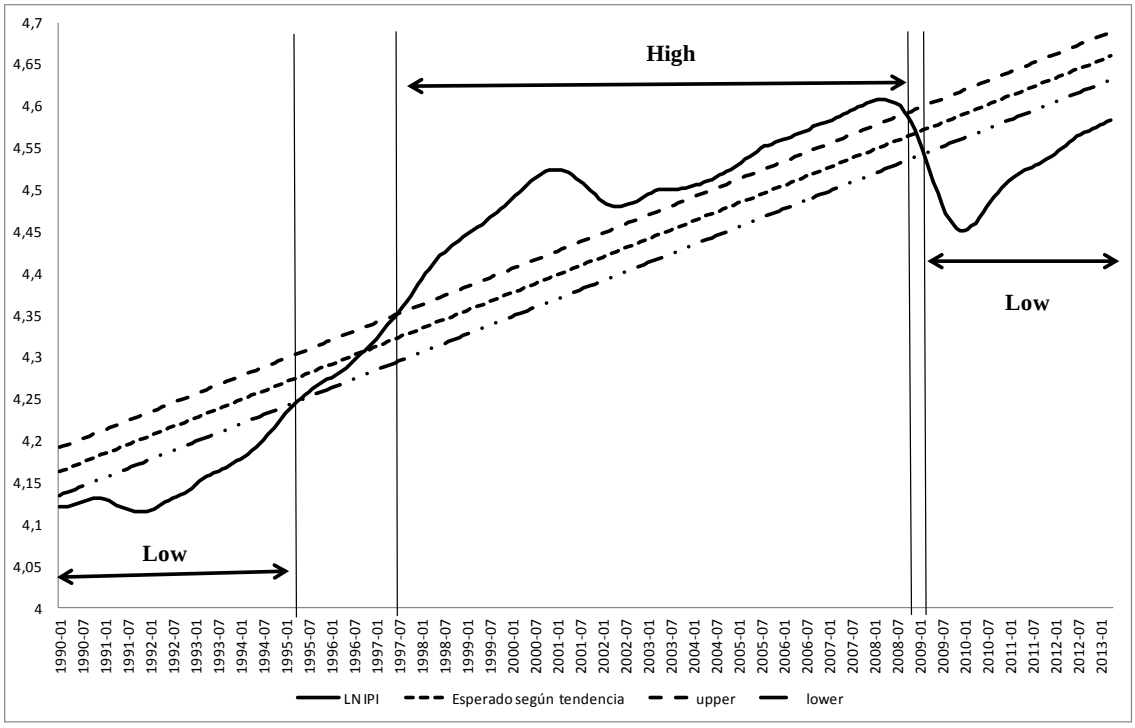

Fig.3. Economic states using McQueen and Roley's methodology

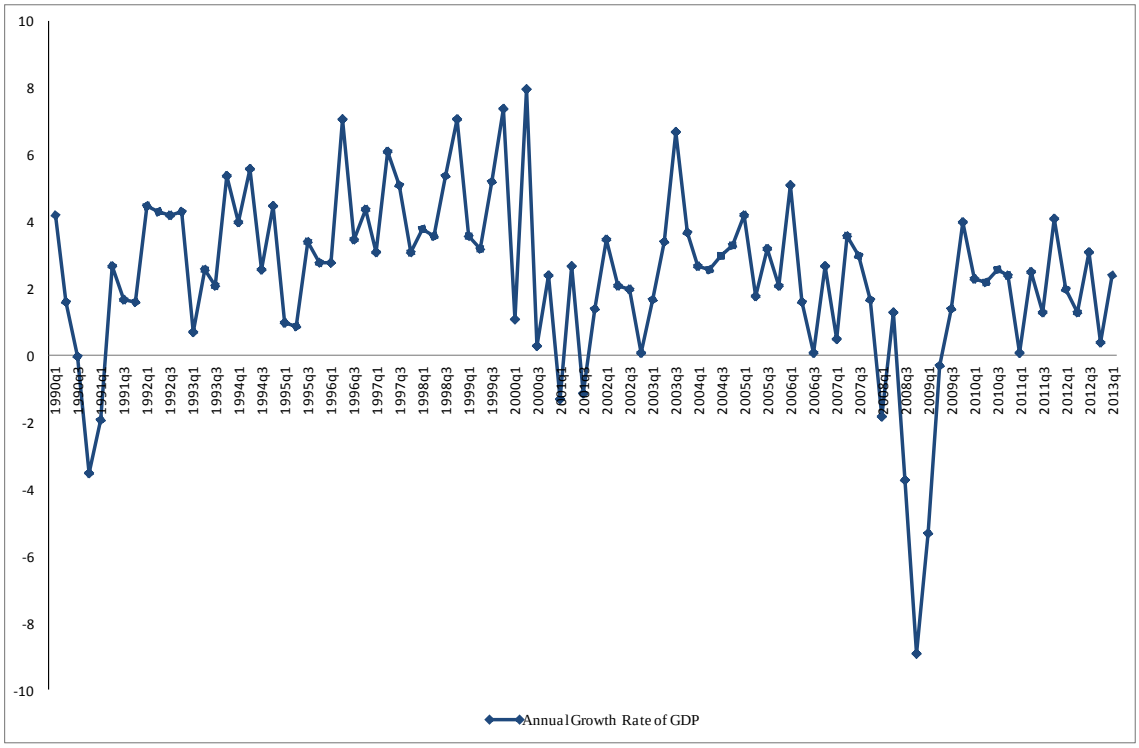

Fig.4. Evolution of the annual growth rate of GDP (%) after seasonally adjusted

Table 8 shows the results of McQueen and Roley's methodology.

Table 8

McQueen and Roley's methodology

Period	State of the Economy - Number of months
January 1990 – April 1995	*Low state – 52 months*
May 1995 – June 1997	*Medium state – 26 months*
July 1997 – September 2008	*High state – 135 months*
October 2008 – February 2009	*Medium state – 5 months*
March 2009 – April 2013	*Low state – 38 months*
Total High state	**135 months**
Total Medium state	**31 months**
Total Low state	**90 months**

Table 9 presents the business cycle timing which is announced by NBER. This classification divides the state of the economy in expansion or contraction months. During the 233 month period January 1990 to June 2009 was in an expansion during 199 months and in contraction during 34 months.[16] There were three contractions and three expansions. On average, the contractions last 11 months and the expansions last 66 months.

Table 9

NBER'S Classification state of the economy

Period	State of the Economy - Number of months
January 1990 – June 1990	*Expansion – 6 months*
July 1990 – February 1991	*Contraction – 8 months*
March 1991 – March 2001	*Expansion – 120 months*
April 2001 – November 2001	*Contraction – 8 months*
December 2001 – December 2007	*Expansion – 73 months*
January 2008 – June 2009	*Contraction – 18 months*
Total Expansion months	**199 months**
Total Contraction months	**34 months**

The following tables present the main statistics of daily returns S&P500 sectors and index on CPI and PPI announcements days. Firstly, we show the results non conditional to the business cycle (table 10) and, then, we show the results conditional to the business cycle (table 11). In table 10, the test of hypothesis that mean is equal to zero in CPI and PPI announcements days cannot be rejected for any sector. Instead, the test of hypothesis that median is equal to zero it have to be rejected for Materials, Consumer Discretionary, Consumer Staples, Health Care and Index in PPI announcements days. We can observe that the most volatile sector is Financials, followed by Information Technology.

Secondly, we analyze the results conditional to the business cycle. We define each announcement month as a recession or expansion month according to the National Bureau of Economic Research (NBER) business cycle dating methodology and McQueen and Roley's methodology. In CPI case, when the economy is in expansion following both classifications, the null hypothesis that mean and median are equal to zero cannot be rejected in any sector. However, the results for PPI are different. Following McQueen and Roley's methodology and NBER's classification we cannot

[16] NBER'S classification only is available until June 2009. In our analysis, we can suppose that from June 2009 until April 2013 the state of the economy is in recession due to the actual economic crisis. McQueen and Roley's methodology corroborate this assumption.

reject the null hypothesis of the mean is equal to zero in any case, except Health Care for NBER's classification. Instead, the median hypothesis is rejected for Materials, Industrials, Consumer Discretionary, Consumer Staples and Health Care in NBER's classification, and only we can rejected the null hypothesis for Consumer Discretionary and Health Care in McQueen and Roley's methodology.

When the economy is in contraction, we only can reject the null hypothesis of mean is equal to zero for Energy and Utilities sectors on CPI announcements days, following NBER's classification. With McQueen and Roley's methodology, only we can reject the null hypothesis of median is equal to zero for Materials and Consumer Discretionary sectors on PPI announcements days.

Table 12 shows a summary of these tests conditional to the business cycle.

Table 10

Summary statistics of daily returns on CPI and PPI announcements days (non conditional to the business cycle)

This table presents the mean daily of returns, the standard deviation of returns, and the minimum and maximum returns of the sectors of S&P500 all days and on CPI and PPI announcements days between January 1990 and April 2013. In each sector, the first line is all days, the second line refers to CPI announcements and the third line refers to PPI announcements. N is the number of observations.[17]

	Mean	Sd.	Max.	Min.	N.
S5ENRS	0.000313	0.015226	0.169604	-0.168836	5878
	-0.000527	0.016019	0.034769	-0.118310	279
	-0.000264	0.015359	0.075059	-0.071166	278
S5MATR	0.000193	0.014480	0.124730	-0.129339	5878
	-0.000722	0.015447	0.054052	-0.086543	279
	0.000028	0.016304	0.048381	-0.07300	278
S5INDU	0.000262	0.012786	0.095116	-0.095987	5878
	0.000118	0.013786	0.046043	-0.059884	279
	0.000169	0.013286	0.042118	-0.072860	278
S5COND	0.000302	0.013369	0.123131	-0.103269	5878
	-0.000487	0.014259	0.070310	-0.065096	279
	0.000611	0.013572	0.045082	0.071267	278
S5CONS	0.000324	0.009771	0.088353	-0.092961	5878
	0.000243	0.009894	0.045846	-0.038625	279
	0.000681	0.009802	0.042808	-0.049031	278
S5HLTH	0.000342	0.012101	0.117131	-0.091733	5878
	-0.000791	0.011887	0.027915	-0.066174	279
	0.001152	0.012200	0.036262	-0.053384	278
S5FINL	0.000201	0.018404	0.172013	-0.186390	5878
	-0.002123	0.021268	0.069458	-0.183121	279
	-0.000258	0.020757	0.0115987	-0.122919	278
S5INFT	0.000337	0.017794	0.160769	-0.100077	5878
	0.000419	0.020936	0.096860	-0.054981	279
	-0.000572	0.018003	0.047536	-0.078143	278
S5TELS	0.000086	0.013794	0.129261	-0.103203	5878
	-0.000778	0.014968	0.047131	-0.103203	279
	-0.000601	0.013336	0.036811	-0.059866	278
S5UTIL	0.000119	0.011073	0.126840	-0.089962	5878
	-0.000578	0.011155	0.058365	-0.054718	279
	-0.000475	0.010285	0.037359	-0.034904	278
S&P500	0.000254	0.011669	0.109572	-0.094695	5878
	0.000208	0.012245	0.050085	-0.063106	279
	0.001043	0.012197	0.046539	-0.094695	278

[17] We have 280 announcements days in our period, but for CPI the 9/04/1993 there is not data on the market and this is the day which the CPI is announced. For PPI, 13/04/1990 and 14/09/2001 there is not data on the market. Therefore, we have 279 and 278 observations, respectively.

Table 11

Summary statistics of daily returns conditional to the business cycle

Table 11.A.- NBER's classification

This table presents the mean daily return, the standard deviation of returns, and the minimum and maximum returns of the sectors of S&P500 all days and on CPI and PPI announcements days conditional to the business cycle by NBER classification. In each sector, the first line is all days, the second line refers to CPI announcements and the third line refers to PPI announcements. p<0.1, [b] p<0.05, [c] p<0.01

	NBER									
	EXPANSION					CONTRACTION				
	Mean	Sd.	Max.	Min.	N.	Mean	Sd.	Max.	Min.	N.
S5ENRS	0.000455	0.012618	0.079420	-0.072121	4203	-0.000036	0.020353	0.169604	-0.168836	1674
	0.001127	0.013394	0.034769	-0.066384	199	-0.004644	0.020720	0.030425	-0.118310	80
	0.000325	0.012018	0.033184	-0.035722	199	-0.001746	0.021632	0.075059	-0.071166	79
S5MATR	0.000253	0.011870	0.069777	-0.080477	4203	0.000041	0.019561	0.124730	-0.129339	1674
	0.000400	0.012218	0.054052	-0.043933	199	-0.003514	0.021317	0.039437	-0.086543	80
	0.001232	0.013565	0.036155	-0.050595	199	-0.003003	0.021538	0.048381	-0.073300	79
S5INDU	0.000369	0.010450	0.069777	-0.072949	4203	0.000005	0.017318	0.095164	-0.095987	1674
	0.001058	0.010927	0.054052	-0.038301	199	-0.002221	0.019020	0.046043	-0.059884	80
	0.001225	0.011087	0.036155	-0.045992	199	-0.002419	0.017461	0.042118	-0.072860	79
S5COND	0.000305	0.011238	0.084677	-0.085614	4203	0.000296	0.017626	0.123131	-0.103269	1674
	-0.000324	0.011231	0.034396	-0.048352	199	-0.000890	0.019978	0.070310	-0.065096	80
	0.001289	0.011906	0.045082	-0.059136	199	-0.001095	0.017035	0.044621	-0.071267	79
S5CONS	0.000331	0.009332	0.075890	-0.092961	4203	0.000309	0.010798	0.088353	-0.066485	1674
	0.000713	0.008879	0.031263	-0.033870	199	-0.000927	0.012039	0.045846	-0.038625	80
	0.001084	0.009786	0.026135	-0.049031	199	-0.000335	0.009831	0.042808	-0.033849	79
S5HLTH	0.000348	0.011835	0.076560	-0.091733	4203	0.000321	0.012750	0.117131	-0.074152	1674
	-0.000319	0.011192	0.024783	-0.045288	199	-0.001965	0.013466	0.027915	-0.066174	80
	0.001839	0.012301	0.034169	-0.053384	199	-0.000580	0.011850	0.036262	-0.047476	79
S5FINL	0.000393	0.012955	0.083875	-0.080421	4203	-0.000282	0.027712	0.172013	-0.186390	1674
	-0.000597	0.012967	0.038741	-0.044054	199	-0.005920	0.033910	0.069458	-0.183121	80
	0.000456	0.014514	0.038400	-0.080421	199	-0.002057	0.031476	0.115987	-0.122919	79
S5INFT	0.000416	0.017561	0.160769	-0.100077	4203	0.000137	0.018376	0.114610	-0.096701	1674
	0.001167	0.020553	0.091552	-0.053780	199	-0.001442	0.021881	0.096860	-0.054981	80
	-0.000066	0.017998	0.047536	-0.078143	199	-0.001846	0.018065	0.046990	-0.060014	79
S5TELS	0.000169	0.013096	0.080276	-0.103203	4203	-0.000118	0.015412	0.129261	-0.086124	1674
	-0.000118	0.015420	0.043299	-0.103203	199	-0.002422	0.013734	0.047131	-0.047819	80
	0.000171	0.013090	0.036811	-0.056157	199	-0.002545	0.013830	0.030342	-0.059866	79
S5UTIL	0.000247	0.009963	0.084832	-0.089962	4203	-0.000198	0.013462	0.126840	-0.085299	1674
	0.000296	0.009824	0.058365	-0.040399	199	-0.002753	0.013757	0.023397	-0.054718	80
	-0.000099	0.009180	0.020871	-0.034904	199	-0.001421	0.012667	0.037359	-0.032352	79
S&P500	0.000333	0.009730	0.055732	-0.071127	4203	-0.000053	0.015508	0.109572	-0.094695	1674
	-0.000216	0.010362	0.027738	-0.060045	199	0.001262	0.016030	0.050085	-0.063106	80
	0.001361	0.010482	0.046539	-0.028459	199	0.000241	0.015764	0.041535	-0.094695	79

Table 11.B.- McQueen and Roley's classification

This table presents the mean daily of returns, the standard deviation of returns, and the minimum and maximum returns of the sectors of S&P500 all days and on CPI and PPI announcements days conditional to the business cycle by McQueen and Roey's classification. In each sector, the first line is all days, the second line refers to CPI announcements and the third line refers to PPI announcements. [a] p<0.1, [b] p<0.05, [c] p<0.01

	McQueen and Roley									
	HIGH AND MEDIUM					LOW				
	Mean	**Sd.**	**Max.**	**Min.**	**N.**	**Mean**	**Sd.**	**Max.**	**Min.**	**N.**
S5ENRS	0.000279	0.017003	0.169604	-0.168836	3483	0.000368	0.012191	0.075079	-0.086357	2394
	-0.001052	0.018320	0.034769	-0.118310	166	0.000243	0.011895	0.030425	-0.045337	113
	-0.000633	0.016889	0.075059	-0.071166	165	0.000319	0.012851	0.034278	-0.058501	113
S5MATR	-0.000002	0.015684	0.124730	-0.129339	3483	0.000476	0.012526	0.066220	-0.075622	2394
	-0.001581	0.017027	0.054052	-0.086543	166	0.000540	0.012744	0.039437	-0.045122	113
	-0.000307	0.017795	0.048381	-0.077300	165	0.000518	0.013905	0.039547	-0.059780	113
S5 INDU	0.000055	0.013624	0.095164	-0.095987	3483	0.000564	0.011457	0.081576	-0.071148	2394
	-0.000015	0.015015	0.046043	-0.059884	166	0.000313	0.011813	0.044219	-0.046540	113
	0.000190	0.014395	0.042118	-0.072860	165	0.000138	0.011541	0.033056	-0.058169	113
S5COND	0.0000067	0.014510	0.123131	-0.103269	3483	0.000645	0.011506	0.070325	-0.069015	2394
	-0.000631	0.015347	0.070310	-0.065096	166	-0.000275	0.012555	0.047175	-0.046580	113
	0.000364	0.014768	0.045082	-0.071267	165	0.000973	0.011660	0.031610	-0.050761	113
S5CONS	0.000178	0.010591	0.088353	-0.092961	3483	0.000538	0.008436	0.045846	-0.051792	2394
	-0.000196	0.010058	0.031263	-0.038625	166	0.000887	0.009656	0.045846	-0.033870	113
	0.000470	0.010993	0.042808	-0.049031	165	0.000989	0.007778	0.018819	-0.018586	113
S5HLTH	0.000234	0.013032	0.117131	-0.091733	3483	0.000496	0.010604	0.050460	-0.053961	2394
	-0.001337	0.012325	0.024783	-0.066174	166	0.000012	0.011217	0.027915	-0.045288	113
	0.001630	0.012748	0.036262	-0.047476	165	0.000453	0.011378	0.034169	-0.053384	113
S5FINL	-0.000058	0.019589	0.172013	-0.186390	3483	0.000577	0.016529	0.163325	-0.121216	2394
	-0.002504	0.023810	0.062775	-0.183121	166	-0.001563	0.016942	0.069458	-0.083806	113
	-0.000760	0.022552	0.115987	-0.122919	165	0.000475	0.017888	0.096223	-0.051429	113
S5INFT	0.000152	0.020629	0.160769	-0.100077	3483	0.000606	0.012581	0.071568	-0.060145	2394
	0.001002	0.024520	0.096860	-0.054981	166	-0.000437	0.014176	0.041536	-0.047726	113
	-0.000912	0.020764	0.047536	-0.078143	165	-0.000075	0.013030	0.041410	-0.054262	113
S5TELS	-0.000041	0.015952	0.129261	-0.103203	3483	0.000273	0.009844	0.059596	-0.055044	2394
	-0.001404	0.017581	0.043299	-0.103203	166	0.000141	0.009965	0.047131	-0.035570	113
	-0.001161	0.015545	0.036811	-0.059866	165	0.000217	0.009212	0.020971	-0.025701	113
S5UTIL	0.000247	0.012727	0.126840	-0.089962	3483	0.000236	0.008086	0.041368	-0.056257	2394
	-0.001274	0.012726	0.058365	-0.054718	166	0.000443	0.008275	0.023397	-0.032644	113
	-0.000610	0.011741	0.037359	-0.034904	165	-0.000278	0.007726	0.028960	-0.024221	113
S&P500	0.0000415	0.012767	0.109572	-0.094695	3483	0.000473	0.009857	0.068366	-0.068958	2394
	0.000356	0.013691	0.050085	-0.063106	166	-0.000011	0.009794	0.029199	-0.045619	113
	0.000846	0.013879	0.046539	-0.094695	165	0.001330	0.009259	0.031634	-0.024985	113

Table 12

Test of Hypothesis: Mean=0 and Median=0

	CPI *Test of Hypothesis: Mean=0*	**PPI** *Median=0*
Expansion NBER	Mean: not rejected Median: not rejected	Mean: rejected for S5HLTH Median: rejected for S5MATR, S5INDU, S5COND, S5 CONS, S5HLTH
Contraction NBER	Mean: rejected for S5ENRS and S5UTIL Median: no rejected	Mean: not rejected Median: not rejected
Expansion MQR	Mean: not rejected Median: not rejected	Mean: not rejected Median: rejected for S5COND and S5HLTH
Contraction MQR	Mean: not rejected Median: not rejected	Mean: not rejected Median: rejected for S5MATR

Finally, we want to confirm if there are significant differences between the mean of a same sector in recession and in expansion periods. We apply the Anova F-test and the Welch F-test. If we can suppose that there are not significant differences, then it is justified to make the analysis with abnormal returns, taking into account only the unexpected component of returns. Table 13 shows the results for CPI and PPI with NBER and McQueen and Roley's classification. We can observe that the null hypothesis only can be rejected in a few cases. Therefore, we can conclude that our analysis is justified.

Table 13

Tests of equality of means in the same sector in expansion and recession periods

This table depicts the tests of equality of means for the same sector in expansion and recession periods. The first line is the Anova F-test and the second line is the Welch F-test. [a] p<0.1, [b] p<0.05, [c] p<0.01

	CPI		PPI	
	NBER	**McQueen and Roley**	**NBER**	**McQueen and Roley**
S5ENRS	7.581505[c]	0.438906	1.027902	0.273199
	5.313557[b]	0.512699	0.644787	0.301982
S5MATR	3.700477[a]	1.268818	3.854270[b]	0.171024
	2.383250	1.412933	2.638326	0.187283
S5 INDU	3.254978[a]	0.037898	4.478722[b]	0.000991
	2.099630	0.041459	3.084094[a]	0.001075
S5COND	0.089635	0.041634	1.750316	0.134863
	0.056991	0.044904	1.296453	0.147143
S5CONS	1.569941	0.804597	1.184920	0.187576
	1.217301	0.817197	1.180195	0.212566
S5HLTH	1.095507	0.866429	2.230987	0.623355
	0.936398	0.898036	2.304414	0.650427
S5FINL	3.607658[a]	0.131133	0.827983	0.236623
	1.861764	0.148610	0.464152	0.257746
S5INFT	0.885577	0.317133	0.551949	0.144542
	0.839390	0.383793	0.550162	0.170236
S5TELS	1.353768	0.715344	2.356382	0.714920
	1.494237	0.870610	2.246878	0.856535
S5UTIL	4.312591[b]	1.596557	0.933835	0.069778
	3.259877[a]	1.864147	0.711834	0.080790
S&P500	0.830758	0.060382	0.475435	0.105174
	0.582247	0.068303	0.338886	0.121514

3.3 Abnormal returns

We want to measure the existence of abnormal returns on the day which CPI and PPI are announced. To do so, we focus our analysis not only on the announcement day; we also analyze the market returns two days before the announcement takes place and two days later. This procedure is related to market efficiency. In this way, we can know if the market reacts to the arrival of new information before it occurs or, even, later. Therefore, we create an 'event window' which is composed of five days: the announcement day (t_j), two days before or 'pre-announcement period' (t_j–1 and t_j–2) and two days after the announcement or 'post-announcement period' (t_j+1 and t_j+2).

In order to test the robustness of the model, we estimate abnormal returns in two different ways.[18] Firstly, we calculate expected returns of each sector in the absence of inflation event. This expected return is estimated as the average daily return of each sector during the estimation period.[19] This approach is called "Mean-adjusted return model" (MAR). This method has an advantage: the results are not conditioned by pricing models. The abnormal returns are calculated by the following equation:

$$\mathrm{AR_i(t_j + k) = RS_i(t_j + k) - E[RS_i(t_j)] = RS_i(t_j + k) - \frac{1}{223}\sum_{\tau=t_{j-274}}^{t_{j-3}} RS_i(\tau)} \qquad (7)$$

Secondly, we calculate the abnormal returns by the "Market Model" (MM). This model relates the return of each sector to the return of the market portfolio. We use the S&P500 Index as the market indicator. The abnormal returns are calculated by the following equation:

$$\mathrm{AR_i = R_i(t_j + k) - E[R_i(t_j)|R_M(t_j)] = R_i(t_j + k) - \hat{\alpha}_i - \hat{\beta}_i\left(R_M(t_j + k)\right)} \qquad (8)$$

where $\hat{\alpha}$ and $\hat{\beta}$ are the parameters estimated by OLS.

Table 14 shows the main statistics of abnormal returns by sector. We have differentiated between abnormal returns calculated by MAR (for CPI and PPI) and abnormal returns calculated by MM (for CPI and PPI, also).

In the case of abnormal returns calculated by MAR (CPI (table 14.A) and PPI (table 14.B)), the test of hypothesis that mean is equal to zero and median is equal to zero cannot be rejected in the bulk of the sectors. Although, when we calculate the abnormal returns by MM, we have to reject these hypotheses in some sectors, specially, in the case of CPI. We also have calculated the test for equality of means, medians and variances between sectors. In tables 14.A, 14.B and 14.D, the equality of means and medians cannot be rejected in any case. The equality of variances is rejected in all tables. In table 14.C, the equality of means and medians has to be rejected two days later the announcement and two days before. These different results justify the fact that it is important to include in the analysis the state of the economy and the direction of the surprises.

[18] MacKinlay (1997) explains the estimation of abnormal returns by different approaches. He concludes that the use of multifactor models for event study is limited. This is due to the explanatory power of additional factors the market factor is small and, therefore; the reduction in the variance is little.
[19] Each estimation period contains 223 days.

Table 14

Summary statistics of abnormal returns by sector on the event window

Table 14.A.- Abnormal returns calculate by MAR (CPI)

This table shows the main statistics of sector abnormal returns in the event window for CPI. The first line is two days before the announcement day, the second line is the announcement day and the third line is two days after the announcement day. [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$

	Mean	Median	Sd.	N
S5ENRS	-0.000653	-0.000053	0.016048	546
	-0.000729	0.000804	0.016019	273
	0.001199[a]	-0.000409	0.016604	546
S5MATR	-0.000073	0.000059	0.016152	546
	-0.000828	-0.000025	0.015542	273
	-0.000078	0.000062	0.014952	546
S5INDU	0.000118	0.000439	0.013810	546
	-0.000026	0.000810	0.013799	273
	0.000046	0.000122	0.012974	546
S5COND	0.000038	0.000477	0.014763	546
	-0.000667	-0.000662	0.014307	273
	0.000034	-0.000017	0.013205	546
S5CONS	0.000246	0.000653	0.010273	546
	0.000044	0.000208	0.009932	273
	-0.000177	-0.000198	0.009303	546
S5HLTH	0.000242	0.000451	0.012139	546
	-0.001031	0.000020	0.011871	273
	0.000442	0.000594[a]	0.011559	546
S5FINL	-0.000238	-0.000423	0.020224	546
	-0.002218[a]	-0.000496	0.021221	273
	0.000562	-0.000668	0.021087	546
S5INFT	-0.000241	0.001094[b]	0.017881	546
	0.000284	0.000500	0.021085	273
	-0.000362	-0.000046	0.017824	546
S5TELS	-0.000599	-0.000458	0.013994	546
	-0.000579	0.000222	0.014872	273
	0.000513	0.000172	0.014149	546
S5UTIL	-0.000339	-0.000028	0.010934	546
	-0.000567	0.000062	0.011153	273
	0.000862	0.000928[b]	0.012645	546

Test of equality among sectors

Method	Two days later	Announc. Day	Two days later	Interpretation
Anova F-test	0.237744	0.565673	0.575895	Equality of means:
Welch F-test	0.289355	0.454108	0.591177	Not rejected
Kruskal-Wallis	5.507588	3.468626	7.256628	Equality of medians:
van der Waerden	5.569243	3.569007	7.211754	Not rejected
Levene	18.20689	11.48034	15.76547	Equality of variances:
Brown-Forsythe	17.93545	11.2447	15.42745	Rejected
Bartlett	502.7732	324.3878	556.5558	

Table 14.B.- Abnormal returns calculate by MAR (PPI)

This table shows the main statistics of sector abnormal returns in the event window for PPI. The first line is two days before the announcement day, the second line is the announcement day and the third line is two days after the announcement day. [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$

	Mean	Median	Sd.	N
S5ENRS	-0.000205	0.000088	0.015055	548
	-0.000579	0.000176	0.015538	272
	0.000204	0.000299	0.015936	548
S5MATR	-0.000699	-0.000763	0.015019	548
	-0.000174	0.000868	0.016514	272
	0.000478	0.000227	0.015036	548
S5INDU	-0.000184	0.000110	0.013098	548
	-0.000092	0.000475	0.013453	272
	0.000661	0.000505	0.013088	548
S5COND	-0.000308	0.000481	0.014160	548
	0.000306	0.000959[b]	0.013739	272
	0.000520	0.000121	0.013793	548
S5CONS	0.000042	0.000108	0.009897	548
	0.000425	0.000467	0.009826	272
	0.000378	0.000629	0.009254	548
S5HLTH	0.000165	0.000119	0.011309	548
	0.000949	0.000844	0.012232	272
	0.000112	0.000395	0.011977	548
S5FINL	-0.000307	-0.000034	0.018089	548
	-0.000416	-0.000351	0.021006	272
	0.000661	0.000384	0.020656	548
S5INFT	-0.000062	0.000550	0.017610	548
	-0.000963	0.000740	0.013441	272
	0.000931	0.001201	0.019436	548
S5TELS	0.000097	-0.000167	0.012724	548
	-0.000700	-0.000491	0.010413	272
	0.000599	0.000492	0.013506	548
S5UTIL	0.000452	0.000478	0.010698	548
	-0.000552	-0.000035	0.010413	272
	0.000156	0.000742	0.011253	548

Test of equality among sectors

Method	Two days later	Announc. Day	Two days later	Interpretation
Anova F-test	0.311456	0.508218	0.196397	Equality of means:
Welch F-test	0.403049	0.618289	0.192256	Not rejected
Kruskal-Wallis	6.215800	7.369678	1.615863	Equality of medians:
van der Waerden	5.116671	5.496257	1.255716	Not rejected
Levene	16.42666	10.97913	20.48844	Equality of variances:
Brown-Forsythe	16.32392	10.72017	20.52581	Rejected
Bartlett	429.3836	290.6239	600.7760	

Table 14.C.- Abnormal returns calculate by MM (CPI)

This table shows the main statistics of sector abnormal returns in the event window for CPI. The first line is two days before the announcement day, the second line is the announcement day and the third line is two days after the announcement day. [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$

	Mean	Median	Sd.	N
S5ENRS	-0.000463	-0.000099	0.015861	550
	-0.000673	0.001288	0.016264	273
	0.001441[b]	0.000011	0.016408	550
S5MATR	-0.000111	0.000114	0.015922	550
	-0.000917	0.000010	0.015508	273
	-0.000058	0.000076	0.014793	550
S5INDU	0.000068	0.000311	0.013575	550
	-0.000024	0.000597	0.013884	273
	0.000098	0.000031	0.012762	550
S5COND	0.002466[c]	0.001930[b]	0.018407	550
	0.001847[a]	0.002807[b]	0.018459	273
	0.002350[c]	0.001698[c]	0.016707	550
S5CONS	0.001113	0.000630[b]	0.013099	550
	0.000806	0.000793	0.012992	273
	0.000773	0.000622	0.011879	550
S5HLTH	0.001410[b]	0.001589[b]	0.015875	550
	0.000045	0.001202	0.015978	273
	0.001635[b]	0.001947[c]	0.015243	550
S5FINL	0.002440[b]	0.002471[c]	0.026906	550
	0.000504	0.001698	0.026631	273
	0.003269[c]	0.002109[b]	0.024853	550
S5INFT	0.002153[b]	0.000884	0.023875	550
	0.002643	0.003446	0.027019	273
	0.002099[b]	0.000865	0.022431	550
S5TELS	0.000312	0.000762	0.017490	550
	0.000216	0.001361	0.019005	273
	0.001478[b]	0.001817[b]	0.017265	550
S5UTIL	0.000485	0.000510	0.015168	550
	0.000215	0.000767	0.016519	273
	0.001798[c]	0.001062[a]	0.016027	550

Test of equality among sectors

Method	Two days later	Announc. Day	Two days later	Interpretation
Anova F-test	1.983458	0.905473	1.896013	Equality of means:
Welch F-test	1.865894	0.808431	1.947390	Rejected two days later and two days before
Kruskal-Wallis	16.41682	8.399411	16.15160	Equality of medians:
van der Waerden	18.34822	9.282573	13.96362	Rejected two days later and two days before
Levene	29.31993	14.45556	25.29328	Equality of variances:
Brown-Forsythe	29.16582	14.34947	24.92589	Rejected
Bartlett	583.5598	327.5601	531.9119	

Table 14.D: Abnormal return calculated by MM (PPI)

This table shows the main statistics of sector abnormal returns in the event window for PPI. The first line is two days before the announcement day, the second line is the announcement day and the third line is two days after the announcement day. [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$

	Mean	Median	Sd.	N
S5ENRS	-0.000313	-0.000115	0.015089	550
	-0.000465	-0.000035	0.015272	274
	0.000077	0.000177	0.015988	550
S5MATR	-0.000713	-0.000662	0.014965	550
	-0.000150	0.001167	0.016309	274
	0.000326	0.000148	0.015023	550
S5INDU	-0.000190	0.000162	0.013049	550
	-0.000090	0.000373	0.013210	274
	0.000553	0.000516	0.013078	550
S5COND	0.000280	0.000562	0.014111	550
	0.000387	0.001019[b]	0.013484	274
	0.000477	0.000194	0.013826	550
S5CONS	-0.000077	0.000181	0.009851	550
	0.000469	0.000703	0.009881	274
	0.000329	0.000530	0.009174	550
S5HLTH	0.000155	-0.000032	0.011247	550
	0.000912	0.001039[a]	0.012271	274
	0.000030	0.000359	0.012044	550
S5FINL	-0.000293	-0.000063	0.018464	550
	-0.000483	-0.000300	0.020891	274
	0.000450	0.000567	0.020536	550
S5INFT	-0.000050	0.000642	0.017557	550
	-0.000921	0.000785	0.018046	274
	0.000845	0.001134[a]	0.019500	550
S5TELS	-0.000112	-0.000022	0.012759	550
	-0.000525	-0.000518	0.013394	274
	0.000593	0.000698	0.013585	550
S5UTIL	0.000301	0.000197	0.010724	550
	-0.000423	-0.000499	0.010489	274
	0.000040	0.000898[a]	0.011289	550

Test of equality among sectors

Method	Two days later	Announc. Day	Two days later	Interpretation
Anova F-test	0.215409	0.398144	0.179502	Equality of means:
Welch F-test	0.251287	0.483392	0.185829	Not rejected
Kruskal-Wallis	3.740867	6.781269	1.229212	Equality of medians:
van der Waerden	2.699684	4.408583	1.329883	Not rejected
Levene	16.70298	10.85052	21.79581	Equality of variances:
Brown-Forsythe	16.58994	10.55935	21.82740	Rejected
Bartlett	413.5167	267.1619	579.9944	

4 Model specification and results

As already mentioned above, the aim of this paper is to measure the impact of inflation news (CPI and PPI news) on the sectors of S&P500. In order to check this hypothesis, we set out the following three equations. Equation (9) measures the impact of total inflation rate on abnormal returns. Equation (10) separates the total inflation rate in two components: the expected and the unexpected component of CPI and PPI rates. Equation (11) only considers the unexpected fraction of CPI and PPI rates.

$$ARS_i(t) = \alpha_i + \beta_i \pi_t + u_{it} \quad (9)$$

$$ARS_i(t) = \alpha_i + \beta_{1i} \pi_t^e + \beta_{2t} \pi_t^u + u_{it} \quad (10)$$

$$ARS_i(t) = \alpha_i + \beta_i \pi_t^u + u_{it} \quad (11)$$

where ARS_{it} are the abnormal returns of sector i in period t, π_t are the monthly CPI and PPI rates, π_t^e are the monthly expected component of CPI and PPI and π_t^u are the monthly unexpected component of CPI and PPI.

We estimate these equations, which not take into account the business cycle. After, we repeat the last equation taking into account the business cycle with NBER's classification and McQueen and Roley's methodology. In this way, we can confirm the traditional hypothesis which affirms that the impact of inflation news depends on the business cycle.[20] Finally, we also introduce in our model the direction of the inflation surprise.

We estimate the response of common stock returns to inflation news two days before the announcement it is occurs (Pre-Event), the day in which the CPI and PPI are announced (Announcement day) and two days later (Post-Event). We estimate all models via 'Seemingly Unrelated Regression' technique (SUR).[21] Estimating the coefficients using SUR allows the error terms across different sectors to be correlated and allow us to bear in mind heteroskedasticity situations.[22]

[20] Veronesi (1999), Díaz and Jareño (2009, 2013), Boyd *et al*. (2005), Andersen *et al*. (2007) and Cenesizoglu (2011), between others.

[21] SUR methodology has been utilized by a lot authors such as Díaz and Jareño (2009, 2013) and Cenesizoglu (2011).

[22] We have also estimated the models by OLS with White heteroskedasticity consistent standard errors and covariance. The estimated coefficients are the same, the difference between both methods are the standard deviations.

4.1 Model non conditional to the business cycle

Our first model estimates the effect of total inflation rate and expected and unexpected component of inflation rate on abnormal returns non conditional to the business cycle. The following tables show the results. The first important conclusion that we obtain in all equations is that CPI news have stronger responses than PPI news. Moreover, the effect of announcements on stock returns is caused by the unexpected component of inflation rate.

Table 15

Response to CPI and PPI announcements non conditional to the business cycle

Table 15.A. CPI (total inflation rate) and MAR method

This table reports the results of this regression:

$$\mathbf{ARS_i(t) = \alpha_i + \beta_i \pi_t + u_{it}}$$

where π_t = CPI and ARS are calculated by mean-adjusted returns method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	CPI	R^2Adj	CPI	R^2Adj	CPI	R^2Adj
S5ENRS	-0.081060	0.0020	0.020770	-0.0034	-0.007922	-0.0018
	(-1.456680)		(0.263598)		(-0.137365)	
S5MATR	-0.082193	0.0021	0.060490	-0.0014	-0.066007	0.0011
	(-1.467086)		(0.792042)		(-1.272612)	
S5INDU	-0.053473	0.0004	0.000707	-0.0037	-0.040658	- 0.0003
	(-1.115177)		(0.010414)		(-0.902495)	
S5COND	-0.054660	0.0002	0.058190	-0.0012	-0.085360[a]	0.0045
	(-1.065592)		(0.827756)		(-1.864656)	
S5CONS	-0.030932	-0.0005	0.037588	-0.0015	-0.096725[c]	-0.0145
	(-0.865857)		(0.770096)		(-3.016247)	
S5HLTH	-0.027733	-0.0011	0.009449	-0.0034	-0.054349	0.0015
	(-0.650451)		(0.161801)		(-1.354537)	
S5FINL	-0.081669	0.0006	0.198004[a]	0.0095	-0.025645	-0.0016
	(-1.160721)		(1.909204)		(-0.350078)	
S5INFT	-0.069175	0.0004	0.092271	-0.0008	-0.066768	0.0003
	(-1.114092)		(0.890820)		(-1.078642)	
S5TELS	-0.094120[a]	0.0050	0.085803	0.0014	-0.114947[b]	0.0082
	(-1.941562)		(1.175701)		(-2.350196)	
S5UTIL	-0.061041	0.0029	0.039975	-0.0017	-0.037918	0.0014
	(-1.609643)		(0.729257)		(-0.863789)	

Table 15.B: CPI (total inflation rate) and MM method

This table reports the results of this regression:

$$\mathbf{ARS_i(t) = \alpha_i + \beta_i \pi_t + u_{it}}$$

where π_t = CPI and ARS are calculated by the market model. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	CPI	R^2Adj	CPI	R^2Adj	CPI	R^2Adj
S5ENRS	-0.058309	0.0020	0.032729	-0.0031	0.016003	-0.0017
	(-1.055711)		(0.409065)		(0.279820)	
S5MATR	-0.065802	0.0007	0.070438	-0.0006	-0.057111	0.0004
	(-1.187035)		(0.923961)		(-1.108637)	
S5INDU	-0.045779	-0.0001	0.012211	-0.0036	-0.033883	- 0.0008
	(-0.968147)		(0.178987)		(-0.762104)	
S5COND	-0.053684	-0.0006	0.061281	-0.0020	-0.093452	0.0029
	(-0.837497)		(0.674264)		(-1.610116)	
S5CONS	-0.031580	-0.0010	0.028439	-0.0030	-0.100082[b]	0.0089
	(-0.691875)		(0.445135)		(-2.433407)	
S5HLTH	-0.048520	-0.0004	-0.020977	-0.0034	-0.082981	0.0026
	(-0.877309)		(-0.266679)		(-1.565776)	
S5FINL	-0.143075	0.0024	0.135347	0.0002	-0.090744	0.0002
	(-1.528818)		(1.033765)		(-1.048500)	
S5INFT	-0.164349[b]	0.0053	-0.006397	-0.0037	-0.162205[b]	0.0060
	(-1.981676)		(-0.048054)		(-2.082792)	
S5TELS	-0.128115[a]	0.0063	0.049478	-0.0027	-0.152783[b]	0.0010
	(-2.111913)		(0.529327)		(-2.553725)	
S5UTIL	-0.098148[a]	0.0045	-0.009536	-0.0036	-0.082329	0.0021
	(-1.861963)		(0.117187)		(-1.476562)	

Tables 15.A and 15.B show the impact of CPI news on abnormal returns calculated by MAR and MM, respectively. We can observe that the results are very similar in both cases. Only a few sectors have a significant response. S5TELS is the only sector that responds significantly two days before the announcement and two days later in both methods (MAR and MM). S5CONS shows significant coefficients two days later the announcement in both methods, also. S5INFT has a weak respond in pre – event and post – event, only in the case of ARS calculated by MM. Finally, S5UTIL and S5FINL have a weak response two days before the announcement and on announcement day, respectively. The relationship between total inflation rate and abnormal returns is negative.

Table 15.C. PPI (total inflation rate) and MAR method

This table reports the results of this regression:

$$\mathbf{ARS_i(t) = \alpha_i + \beta_i \pi_t + u_{it}}$$

where π_t = PPI and ARS are calculated by mean-adjusted returns. t-statistics are in parentheses:[a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	PPI	R^2Adj	PPI	R^2Adj	PPI	R^2Adj
S5ENRS	0.000086	-0.0018	-0.003825	-0.0034	0.000463	-0.0018
	(0.009326)		(-0.286107)		(0.047584)	
S5MATR	0.004487	-0.0014	-0.004095	-0.0034	-0.002678	-0.0017
	(0.489784)		(-0.288035)		(-0.291986)	
S5INDU	0.007709	-0.0001	-0.006999	-0.0023	-0.001663	- 0.0018
	(0.965589)		(-0.604574)		(-0.208306)	
S5COND	0.014102	0.0030	-0.006557	-0.0026	-0.012700	0.0023
	(1.636431)		(-0.553572)		(-1.512574)	
S5CONS	0.006670	0.0004	-0.002724	-0.0033	-0.001799	-0.0016
	(1.106079)		(-0.321079)		(-0.318690)	
S5HLTH	0.002554	-0.0016	-0.009452	-0.0008	-0.002895	-0.0015
	(0.370229)		(-0.893567)		(-0.396281)	
S5FINL	0.010494	-0.0002	-0.020585	0.0012	-0.015424	0.0009
	(0.951744)		(-1.141481)		(-1.225715)	
S5INFT	0.010131	-0.0002	0.010403	-0.0021	-0.019012	0.0029
	(0.943870)		(0.666616)		(-1.607247)	
S5TELS	0.001553	-0.0018	0.000546	-0.0037	-0.007336	-0.0004
	(0.200056)		(0.047170)		(-0.890978)	
S5UTIL	0.000137	-0.0018	-0.010349	0.0012	0.000804	-0.0018
	(0.021062)		(1.157052)		(0.117114)	
S&P500	0.008059	0.0006	-0.003862	-0.0032	-0.004030	-0.0013
	(1.148614)		(-0.370921)		(-0.520295)	

Tables 15.C. and 15.D. show the impact of PPI news (total inflation rate) on abnormal returns calculated by MAR and MM, respectively. The estimated coefficients are very similar in both cases. For PPI, the results show that there is a not significant reaction in any industry.

Table 15.D. PPI (total inflation rate) and MM method

This table reports the results of this regression:

$$\mathbf{ARS_i(t) = \alpha_i + \beta_i \pi_t + u_{it}}$$

where π_t = PPI and ARS are calculated by the market model. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	PPI	R^2Adj	PPI	R^2Adj	PPI	R^2Adj
S5ENRS	0.001029	-0.0018	-0.003967	-0.0034	0.000536	-0.0018
	(0.111616)		(-0.300798)		(0.054887)	
S5MATR	0.004223	-0.0014	-0.003416	-0.0035	-0.002614	-0.0017
	(0.461947)		(-0.242555)		(-0.284975)	
S5INDU	0.007542	-0.0002	-0.006475	-0.0025	-0.002050	- 0.0017
	(0.946499)		(-0.567836)		(-0.256990)	
S5COND	0.013668	0.0028	-0.006700	-0.0025	-0.014082	0.0033
	(1.588602)		(-0.575663)		(-1.653538)	
S5CONS	0.007436	0.0010	-0.002753	-0.0033	-0.001863	-0.0016
	(1.237591)		(-0.322687)		(-0.333940)	
S5HLTH	0.003220	-0.0014	-0.009088	-0.0010	-0.003156	-0.0015
	(0.468728)		(-0.858616)		(-0.429388)	
S5FINL	0.010123	-0.0004	-0.020447	0.0010	-0.016647	0.0014
	(0.898591)		(-1.135802)		(-1.329847)	
S5INFT	0.010670	-0.0001	0.010553	-0.0020	-0.019535	0.0031
	(0.995401)		(0.677683)		(-1.644855)	
S5TELS	0.002208	-0.0017	0.000009	-0.0037	-0.008426	0.0001
	(0.283674)		(0.000800)		(-1.017455)	
S5UTIL	0.000905	-0.0018	-0.010453	0.0012	0.000976	-0.0018
	(0.138111)		(1.156658)		(0.141648)	

Our results allow us to conclude that the total inflation rate not causes a strong response on stock returns. Therefore, next equation (10) separates the total inflation rate in two components: expected and unexpected component. In this way, we can measure which of both components cause a greater effect on returns.

Table 15.E: Expected and unexpected component of CPI and MAR method

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^e + \beta_{2t}\pi_t^u + u_{it}$$

where π_t^e = CPIE (expected component of CPI) and π_t^u = CPIU (unexpected component of CPI). ARS are calculated by mean-adjusted returns method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	CPIE	CPIU	R^2 Adj	CPIE	CPIU	R^2 Adj	CPIE	CPIU	R^2 Adj
S5ENRS	-0.089006 (-1.579145)	0.067580 (0.408418)	0.0018	0.005036 (0.063209)	0.285715 (1.220457)	-0.0019	0.013545 (0.232760)	-0.370642[b] (-2.169551)	0.0056
S5MATR	-0.104643[a] (-1.852982)	0.308208[a] (1.859059)	0.0114	0.052884 (0.683483)	0.188559 (0.829359)	-0.0038	-0.043419 (-0.831016)	-0.445309[c] (-2.903220)	0.0117
S5INDU	-0.068731 (-1.418958)	0.208441 (1.465844)	0.0055	-0.004859 (-0.070632)	0.094431 (0.467155)	-0.0065	-0.013352 (-0.295886)	-0.494701[c] (-3.734403)	0.0215
S5COND	-0.072542 (-1.400838)	0.249525 (1.641340)	0.0065	0.057847 (0.811691)	0.063959 (0.305423)	-0.0049	-0.053559 (-1.172670)	-0.616086[c] (-4.594845)	0.0338
S5CONS	-0.040321 (-1.116172)	0.132630 (1.250630)	0.0025	0.039948 (0.807432)	-0.002146 (-0.014760)	-0.0049	-0.077756[b] (-2.418785)	-0.408980[c] (-4.333674)	0.0344
S5HLTH	-0.040648 (-0.943285)	0.187261 (1.480272)	0.0030	-0.000529 (-0.008952)	0.177462 (1.022090)	-0.0034	-0.030081 (-0.748351)	-0.455565[c] (-3.860512)	0.0229
S5FINL	-0.112524 (-1.590876)	0.443042[b] (2.133662)	0.0171	0.185662[a] (1.767504)	0.405820 (1.314814)	0.0077	0.022330 (0.304988)	-0.827716[c] (-3.850936)	0.0245
S5INFT	-0.090046 (-1.436069)	0.284442 (1.545226)	0.0061	0.102859 (0.980215)	-0.086025 (-0.278995)	-0.0031	-0.055505 (-0.885404)	-0.240307 (-1.305759)	0.0003
S5TELS	-0.120680[b] (-2.481239)	0.361240[b] (2.529987)	0.0234	0.092762 (1.254528)	-0.031388 (-0.144464)	-0.0011	-0.085054[a] (-1.737523)	-0.622925[c] -4.334705	0.0313
S5UTIL	-0.065379[a] (-1.701594)	0.018091 (0.160392)	0.0020	0.025010 (0.452278)	0.291959[a] (1.796845)	0.0044	-0.022153 (-0.500071)	-0.308993[b] (-2.375952)	0.0066

Tables 15.E. and 15.F. show the impact of expected and unexpected components of CPI on abnormal returns. Now, we can observe a lot significant responses of the majority of the sectors. S5TELS is the only sector again that has a significant response two days before the announcement and two days later in both components of inflation rate and in both methods (MAR and MM). All sectors have a negative response to unexpected component of CPI two days later the announcement is published. In the first table, we observe that all sectors show significant coefficients on post-event period except S5INFT. Any sector has significant responses on announcement day, except S5FINL, S5UTIL and S5HLTH but their responses are weak. In the case of ARS calculated by MM, the bulk of the sectors show a significant response two days before the announcement. The sign of the estimated coefficients are positive on CPIU two days before the announcement and negative two days later.

Table 15.F: Expected and unexpected component of CPI and MM method

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^e + \beta_{2t}\pi_t^u + u_{it}$$

where π_t^e = CPIE (expected component of CPI) and π_t^u = CPIU (unexpected component of CPI). ARS are calculated by market model method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	CPIE	CPIU	R^2 Adj	CPIE	CPIU	R^2 Adj	CPIE	CPIU	R^2 Adj
S5ENRS	-0.068231 (-1.219811)	0.116094 (0.706208)	0.0006	0.015838 (0.195829)	0.317161 (1.334634)	-0.0009	0.039332 (0.682113)	-0.380735[b] (-2.246709)	0.0076
S5MATR	-0.089177 (-1.596401)	0.336971[b] (2.052539)	0.0112	0.062835 (0.813545)	0.198472 (0.874527)	-0.0029	-0.034061 (-0.656500)	-0.446773[c] (-2.930030)	0.0118
S5INDU	-0.062106 (-1.300594)	0.230929[a] (1.645508)	0.0061	0.006117 (0.088485)	0.114829 (0.565331)	-0.0062	-0.006322 (-0.142061)	-0.498338[c] (-3.810068)	0.0227
S5COND	-0.090912 (-1.415389)	0.590232[c] (3.126709)	0.0209	0.041476 (0.451565)	0.394765 (1.462691)	0.0006	-0.082722 (-1.407524)	-0.284149 (-1.645095)	0.0036
S5CONS	-0.055027 (-1.200400)	0.381382[c] (2.830893)	0.0161	0.015671 (0.242587)	0.243441 (1.282503)	-0.0014	-0.093075[b] (-2.234120)	-0.217012[a] (-1.772420)	0.0089
S5HLTH	-0.075682 (-1.360916)	0.418501[b] (2.560621)	0.0142	-0.047275 (-0.597248)	0.421863[a] (1.813712)	0.0077	-0.074111 (-1.380651)	-0.238754 (-1.513443)	0.0028
S5FINL	-0.205227[b] (-2.196765)	0.936536[c] (3.411029)	0.0312	0.089282 (0.678206)	0.911029[b] (2.355184)	0.0129	-0.075944 (-0.866449)	-0.358543 (-1.391873)	0.0006
S5INFT	-0.206068[b] (-2.472254)	0.557289[b] (2.274969)	0.0208	-0.019085 (-0.141500)	0.207250 (0.522947)	-0.0062	-0.173128[b] (-2.193994)	0.020004 (0.086257)	0.0055
S5TELS	-0.165654[c] (-2.729838)	0.524807[c] (2.942712)	0.0309	0.044984 (0.474773)	0.125154 (0.449540)	-0.0061	-0.132760[b] (-2.197175)	-0.497704[c] (-2.802733)	0.0158
S5UTIL	-0.125042[b] (-2.361442)	0.0373920[b] (2.402763)	0.0209	-0.052291 (-0.645703)	0.710390[c] (2.985369)	0.0293	-0.091580 (-1.621280)	0.061395 (0.369829)	0.0019

Table 15.G: Expected and unexpected component of PPI and MAR method

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^e + \beta_{2t}\pi_t^u + u_{it}$$

where π_t^e = PPIE (expected component of PPI) and π_t^u = PPIU (unexpected component of PPI). ARS are calculated by mean-adjusted returns mrthod. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	PPIE	PPIU	R^2 Adj	PPIE	PPIU	R^2 Adj	PPIE	PPIU	R^2 Adj
S5ENRS	0.000043 (0.004611)	-0.021899 (-0.622948)	-0.0029	-0.004647 (-0.348052)	-0.190921 (-0.853957)	-0.0042	0.002035 (0.207189)	-0.033041 (-0.888413)	-0.0020
S5MATR	0.003200 (0.345396)	0.007100 (0.202412)	-0.0034	-0.001377 (-0.097157)	-0.299872 (-1.263124)	-0.0015	-0.002692 (-0.290236)	-0.003702 (-0.105427)	-0.0035
S5INDU	0.006577 (0.814470)	0.005557 (0.181751)	-0.0025	-0.005381 (-0.465385)	-0.169245 (-0.874048)	-0.0037	-0.001713 (-0.212308)	0.021062 (0.689314)	-0.0026
S5COND	0.013220 (1.516706)	0.016598 (0.502896)	0.0007	-0.003372 (-0.284825)	-0.140095 (-0.706610)	-0.0052	-0.012835 (-1.513181)	0.025562 (0.795872)	0.0025
S5CONS	0.008122 (1.334793)	-0.026105 (-1.132990)	0.0029	-0.000471 (-0.055528)	-0.002119 (-0.014916)	-0.0074	-0.001464 (-0.256411)	-0.001700 (-0.078634)	-0.0035
S5HLTH	0.003447 (0.494225)	-0.007873 (-0.298137)	-0.0030	-0.007950 (-0.752638)	-0.175237 (-0.990721)	-0.0015	-0.002029 (-0.274709)	-0.015987 (-0.571652)	-0.0030
S5FINL	0.010528 (0.944322)	0.006804 (0.161155)	-0.0020	-0.017022 (-0.951291)	-0.640391[b] (-2.137244)	0.0131	-0.015330 (-1.204794)	0.004701 (0.097580)	-0.0009
S5INFT	0.009575 (0.882080)	0.013090 (0.318476)	-0.0022	0.011073 (0.709626)	-0.055268 (-0.211516)	-0.0054	-0.019688[a] (-1.646303)	-0.000519 (-0.011462)	0.0014
S5TELS	0.002241 (0.285591)	-0.013040 -0.438887	-0.0031	0.003257 (0.281628)	-0.147099 (-0.759698)	-0.0051	-0.007093 (-0.851926)	-0.011513 (-0.365183)	-0.0022
S5UTIL	-0.000586 (-0.088860)	0.003963 (0.158585)	-0.0036	-0.008997 (-1.005393)	0.056180 (0.374913)	-0.0033	0.001518 (0.021884)	-0.018554 (-0.706311)	-0.0026

Tables 15.G. and 15.H. show the impact of expected and unexpected components of PPI on abnormal returns. The results are consistent with the previous results for PPI. In the case of ARS calculated by MAR, only two sectors have a significant response: S5FINL (on announcement day) and S5INFT (two days later). On the other case, only there is a significant response for S5INFT, two days later which the announcement is published.

Table 15.H: Expected and unexpected component of PPI and MM method

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^e + \beta_{2t}\pi_t^u + u_{it}$$

where π_t^e = PPIE (expected component of PPI) and π_t^u = PPIU (unexpected component of PPI). ARS are calculated by market model method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	PPIE	PPIU	R^2 Adj	PPIE	PPIU	R^2 Adj	PPIE	PPIU	R^2 Adj
S5ENRS	0.000960 (0.102941)	-0.017342 (-0.491361)	-0.0032	-0.004510 (-0.339340)	0.012097 (0.235751)	-0.0067	0.001974 (0.200163)	-0.038174 (-1.022470)	-0.0015
S5MATR	0.002940 (0.318052)	0.008233 (0.235170)	-0.0034	-0.002469 (-0.174008)	-0.031403 (-0.573237)	-0.0062	-0.002697 (-0.290763)	-0.009032 (-0.257123)	-0.0034
S5INDU	0.006431 (0.797957)	0.007380 (0.241828)	-0.0025	-0.005908 (-0.514118)	-0.023231 (-0.523632)	-0.0057	-0.002172 (-0.269398)	0.018510 (0.606316)	-0.0028
S5COND	0.012803 (1.471332)	0.018372 (0.557570)	0.0005	-0.005470 (-0.466772)	-0.043072 (-0.952043)	-0.0036	-0.014313 (-1.683513)	0.020786 (0.645671)	0.0030
S5CONS	0.008903 (1.468518)	-0.024261 (-1.056797)	0.0033	-0.001569 (-0.182855)	-0.037748 (-1.139226)	-0.0026	-0.001609 (-0.285200)	-0.003750 (-0.175509)	-0.0035
S5HLTH	0.004089 (0.588738)	-0.004675 (-0.177742)	-0.0029	-0.008644 (-0.810268)	-0.022221 (-0.539527)	-0.0043	-0.002353 (-0.316773)	-0.020688 (-0.735483)	-0.0026
S5FINL	0.009937 (0.872347)	0.010566 (0.244951)	-0.0023	-0.019578 (-1.079123)	-0.046128 (-0.658561)	-0.0021	-0.016904 (-1.335473)	0.009148 (0.190869)	-0.0004
S5INFT	0.010072 (0.929217)	0.018087 (0.440661)	-0.0019	0.011118 (0.708311)	-0.006124 (-0.101068)	-0.0054	-0.020241[a] (-1.685634)	-0.004763 (-0.104744)	0.0016
S5TELS	0.002870 (0.364697)	-0.010785 (-0.361980)	-0.0031	0.001233 (0.105854)	-0.036158 (-0.804111)	-0.0049	-0.008282 (-0.989019)	-0.015730 (-0.496095)	-0.0017
S5UTIL	0.000223 (0.033671)	0.005891 (0.234789)	-0.0037	-0.009735 (-1.069333)	-0.031682 (0.901411)	-0.0011	0.001608 (0.230989)	-0.020557 (-0.779718)	-0.0023

Therefore, we can deduce the first conclusions of our analysis. The most important conclusion is that our model is consistent with the fact that the market has a strong reaction for CPI news. By contrast, we could affirm that PPI announcements not cause significant reactions on the market. These results lead us to think that it is necessary to include in our analysis the state of the economy and the direction of the inflation surprises. In this way, we can corroborate the stability of our results. On the other hand, the second valuable conclusion is that the sectors react stronger to unexpected component of inflation rate than the expected component. Therefore, we are going to continue our analysis with equation (11). This equation only measures the unexpected component of inflation rate. Finally, we also want to emphasize the fact that the significant responses are obtained two days before the announcement and, above all, two days later. On announcement day, we hardly have significant effects. This conclusion is related to market efficiency. We think that it is necessary again to take into account the business cycle and the direction of the surprises of inflation rate. If we get the same conclusions, we can affirm that the market is inefficient in the sense that reacts late to the arrival of new information.

Table 15.I: Unexpected component of CPI and MAR method

This table reports the results of this regression:

$$ARS_i(t) = \boldsymbol{\alpha}_i + \boldsymbol{\beta}_i \boldsymbol{\pi}_t^u + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI). ARS are calculated by mean-adjusted returns method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	CPIU	R^2Adj	CPIU	R^2Adj	CPIU	R^2Adj
S5ENRS	0.113243	-0.0010	0.283106	0.0018	-0.377591[b]	0.0073
	(0.693502)		(1.228547)		(-2.244659)	
S5MATR	0.361894[b]	0.0070	0.161164	-0.0018	-0.423034[c]	0.0123
	(2.210081)		(0.719530)		(-2.799336)	
S5INDU	0.243702[a]	0.0037	0.096948	-0.0028	-0.487851[c]	0.0231
	(1.737411)		(0.487233)		(-3.739952)	
S5COND	0.286742[a]	0.0048	0.033993	-0.0036	-0.588609[c]	0.0332
	(1.912202)		(0.164712)		(-4.452939)	
S5CONS	0.153316	0.0021	-0.022839	-0.0036	-0.369089[c]	0.0259
	(1.466615)		(-0.159413)		(-3.951066)	
S5HLTH	0.208115	0.0032	0.177736	-0.0036	-0.440133[c]	0.0237
	(1.669472)		(1.039956)		(-3.786090)	
S5FINL	0.500770[b]	0.0090	0.309644	0.0001	-0.839172[c]	0.0261
	(2.443731)		(1.013397)		(-3.964916)	
S5INFT	0.330638	0.0042	-0.139307	-0.0029	-0.211832	0.0007
	(1.820836)		(-0.458182)		(-1.168184)	
S5TELS	0.423152[c]	0.0143	-0.079440	-0.0032	-0.579290[c]	0.0082
	(2.993148)		(-0.037380)		(-4.082833)	
S5UTIL	0.051633	-0.0014	0.279004[a]	0.0074	-0.297628[b]	0.0014
	(0.463686)		(1.743781)		(-2.323798)	

Tables 15.I. and 15.J. show the results for the unexpected component of CPI with MAR and MM methods. The first important aspect to consider is that the estimated coefficients are negative and statistically significant in post-event period, particularly in the case of MAR. Instead, in pre-event period, the coefficients are positive and statistically significant in the case of MM. On announcement day, a little number of sectors responds to the arrival of new information, again. Only there is a significant response in the case of MAR (S5UTIL), and there are three sectors in the case of MM (S5 HLTH, S5FINL and S5UTIL). On announcement days, the response is positive. In the case of PPI (Tables 15.K. and 15.L.), we do not get a significant effect in any sector.

Table 15.J: Unexpected component of CPI and MM method

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_i \pi_t^u + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI). ARS are calculated by market model method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	CPIU	R^2Adj	CPIU	R^2Adj	CPIU	R^2Adj
S5ENRS	0.151386	-0.0002	0.308956	0.0027	-0.401079[b]	0.0086
	(0.934231)		(1.320705)		(-2.403271)	
S5MATR	0.383098[b]	0.0083	0.165922	-0.0017	-0.429155[c]	0.0129
	(2.365016)		(0.741839)		(-2.857992)	
S5INDU	0.263053[a]	0.0047	0.111660	-0.0025	-0.495068[c]	0.0244
	(1.901203)		(0.558471)		(-3.845016)	
S5COND	0.637256[c]	0.0191	0.373280	0.0035	-0.241361	0.0018
	(3.423098)		(1.404566)		(-1.416971)	
S5CONS	0.409845[c]	0.0153	0.235323	0.0021	-0.168868	0.0017
	(3.086349)		(1.259327)		(-1.394748)	
S5HLTH	0.457648[c]	0.0127	0.446335[a]	0.0101	-0.200420	0.0012
	(2.839751)		(1.948264)		(-1.288355)	
S5FINL	1.0420689[c]	0.0244	0.864780[b]	0.0149	-0.319260	0.0011
	(3.841006)		(2.269282)		(-1.258169)	
S5INFT	0.663878[c]	0.0117	0.217136	-0.0026	0.109555	-0.0014
	(2.737836)		(0.556590)		(0.477798)	
S5TELS	0.610492[c]	0.0195	0.101852	-0.0032	-0.429034[b]	0.0091
	(3.454040)		(0.371508)		(-2.443602)	
S5UTIL	0.438598[c]	0.0128	0.737477[c]	0.0314	-0.108765	-0.0010
	(2.848613)		(3.146112)		(0.663973)	

Table 15.K: Unexpected component of PPI and MAR method

This table reports the results of this regression:

$$ARS_i(t) = \boldsymbol{\alpha}_i + \boldsymbol{\beta}_i \boldsymbol{\pi}_t^u + u_{it}$$

π_t^u = PPIU (unexpected component of PPI). ARS are calculated by mean-adjusted returns. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	PPIU	R^2Adj	PPIU	R^2Adj	PPIU	R^2Adj
S5ENRS	-0.021924	-0.0011	0.019782	-0.0031	-0.034227	-0.0002
	(-0.631173)		(0.383626)		(-0.931345)	
S5MATR	0.005236	-0.0018	-0.028720	-0.0027	-0.002134	-0.0018
	(0.151052)		(-0.523920)		(-0.061499)	
S5INDU	0.001726	-0.0018	-0.017334	-0.0031	0.022060	- 0.0009
	(0.057082)		(-0.388028)		(0.730650)	
S5COND	0.008896	-0.0017	-0.041846	-0.0006	0.033039	0.0001
	(0.272213)		(-0.916737)		(1.038918)	
S5CONS	-0.030837	0.0015	-0.033419	0.0001	-0.000847	-0.0018
	(-1.352293)		(-1.023126)		(-0.039653)	
S5HLTH	-0.009881	-0.0016	-0.015317	-0.0032	-0.014805	-0.0013
	(-0.378603)		(-0.374951)		(-0.535728)	
S5FINL	0.000670	-0.0018	-0.027639	-0.0031	0.013633	-0.0017
	(0.016040)		(-0.396501)		(0.285981)	
S5INFT	0.007512	-0.0018	-0.008110	-0.0036	0.010952	-0.0017
	(0.184830)		(-0.134624)		(0.244150)	
S5TELS	-0.014345	-0.0014	-0.034688	-0.0015	-0.007380	-0.0017
	(-0.488610)		(-0.777708)		(-0.236770)	
S5UTIL	0.004304	-0.0018	-0.022071	-0.0022	-0.019439	-0.0008
	(0.174332)		(-0.638635)		(-0.748867)	

Table 15.L: Unexpected component of PPI and MM method

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_i \pi_t^u + u_{it}$$

where π_t^u = PPIU (unexpected component of PPI). ARS are calculated by market model method. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event		Announcement day		Post - Event	
	PPIU	R^2Adj	PPIU	R^2Adj	PPIU	R^2Adj
S5ENRS	-0.017901	-0.0014	0.014411	-0.0034	-0.039324	0.0002
	(-0.513306)		(0.283302)		(-1.065921)	
S5MATR	0.006520	-0.0018	-0.030137	-0.0026	-0.007460	-0.0017
	(0.188464)		(-0.555005)		(-0.214929)	
S5INDU	0.003633	-0.0018	-0.020200	-0.0029	0.019775	- 0.0010
	(0.120419)		(-0.459160)		(0.655528)	
S5COND	0.010913	-0.0016	-0.040265	-0.0007	0.029125	-0.0003
	(0.334522)		(-0.897618)		(0.913240)	
S5CONS	-0.029448	0.0012	-0.036943	0.0009	-0.002812	-0.0018
	(-1.295654)		(-1.124835)		(-0.133205)	
S5HLTH	-0.007058	-0.0017	-0.017786	-0.0030	-0.019317	-0.0009
	(-0.271473)		(-0.435187)		(-0.694956)	
S5FINL	0.004776	-0.0018	-0.036083	-0.0027	0.000700	-0.0018
	(0.111988)		(-0.518654)		(0.014759)	
S5INFT	0.012219	-0.0017	-0.011829	-0.0035	0.007030	-0.0018
	(0.301042)		(-0.196766)		(0.156066)	
S5TELS	-0.012457	-0.0015	-0.036791	-0.0012	-0.010905	-0.0016
	(-0.423079)		(-0.825284)		(-0.347759)	
S5UTIL	0.005761	-0.0017	-0.026687	-0.0015	-0.021494	-0.0006
	(0.232375)		(-0.764496)		(-0.825042)	

4.2 Model conditional to the business cycle

In the previous analysis, we have confirmed that stock returns respond negatively to unexpected component of inflation news two days after the announcement is published with ARS calculated by MAR; whereas, in the case of ARS calculated by MM, stock returns respond positively to unexpected component of inflation news two days before the announcement is published. In the following analysis, we want to measure this effect over the business cycle. Several previous studies, including McQueen and Roley (1993), Veronesi (1999), Andersen *et al*. (2007), Boyd *et al*. (2005), and more recently, Cenesizoglu (2011) and Díaz and Jareño (2009, 2013) between other, analyze the reaction of S&P500 returns (Díaz and Jareño for Spanish market) to macroeconomic news conditional to the business cycle and they find that this reaction differs between economic expansion and recession periods. Aforementioned, we have utilized two classifications of the state of the economy, NBER and McQueen and Roley's methodology. In this way, we can test the robustness of the results. In

order to take into account the business cycle, we modify equation (11) and we introduce two dummy variables in the case of NBER classification: D_H and D_L (equation 12), and three in the case of McQueen and Roley's methodology: D_H, D_M and D_L (equation 13). D_H is equal to 1 when the state of the economy is high, D_M is equal to 1 when the state of the economy is medium and D_L is equal to 1 when the state of the economy is low. The value of these variables is zero otherwise.

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_L + u_{it} \qquad (12)$$

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_M + \beta_{3i}\pi_t^u * D_L + u_{it} \quad (13)$$

The following tables show the results of our model conditional to the business cycle. We can conclude that the state of the economy is an important variable in the model. The investors react the different form depending on if the economy goes through an expansion or a contraction period.

Table 16

Response to CPI and PPI announcements conditional to the business cycle

Table 16.A: Unexpected component of CPI and MAR method conditional to the business cycle by NBER's classification

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_L + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI), and D_H and D_L are dummy variables. D_H is equal to 1 when the economy is in expansion and it is equal to zero otherwise. D_L is equal to 1 when the economy is in contraction and it is equal to zero otherwise. ARS are calculated by mean-adjusted returns method. The state of the economy is classified by NBER. t-statistics are in parentheses: [a] p<0.1,[b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	CPIU (D_H)	CPIU (D_L)	R^2 Adj	CPIU (D_H)	CPIU (D_L)	R^2 Adj	CPIU (D_H)	CPIU (D_L)	R^2 Adj
S5ENRS	0.002380 (0.010022)	0.212478 (0.945606)	-0.0020	-0.474253 (-1.441606)	0.963298[c] (3.089790)	0.0337	0.109105 (0.448848)	-0.813245[c] (-3.536177)	0.0191
S5MATR	0.165039 (0.693531)	0.538103[b] (2.390011)	0.0075	0.066462 (0.204183)	0.246217 (0.798165)	-0.0050	-0.104677 (-0.477802)	-0.708003[c] (-3.415776)	0.0177
S5INDU	0.220513 (1.080502)	0.264459 (1.369635)	0.0019	0.000895 (0.003094)	0.83215 (0.668638)	-0.0058	-0.259476 (-1.370575)	-0.692276[c] (-3.864934)	0.0262
S5COND	0.206422 (0.946319)	0.358638[a] (1.737782)	0.0035	-0.075435 (-0.251560)	0.132272 (0.455445)	-0.0064	-0.265632 (-1.387926)	-0.877714[c] (-4.847246)	0.0408
S5CONS	0.220640 (1.451099)	0.093053 (0.646844)	0.0009	-0.135800 (-0.652711)	0.078612 (0.398695)	-0.0053	-0.147315 (-1.088872)	-0.567605[c] (-4.434367)	0.0331
S5HLTH	0.203264 (1.120665)	0.212456 (1.238057)	0.0014	-0.080744 (-0.326230)	0.409879[a] (1.747443)	0.0041	-0.289436[a] (-1.713542)	-0.575025[c] (-3.598196)	0.0246
S5FINL	0.253396 (0.850884)	0.722201[b] (2.563211)	0.0095	-0.432032 (-0.982241)	0.975791[b] (2.340851)	0.0158	-0.320579 (-1.046154)	-1.303379[c] (-4.495600)	0.0339
S5INFT	0.547066[b] (2.073004)	0.136907 (0.548331)	0.0047	-0.398620 (-0.902982)	0.093584 (0.223694)	-0.0042	0.211390 (0.804792)	-0.590668[b] (-2.376835)	0.0077
S5TELS	0.267068 (1.299644)	0.562867[c] (2.895103)	0.0014	-0.199452 (-0.640040)	0.028345 (0.095979)	-0.0059	-0.467752[b] (-2.266929)	-0.679131[c] (-3.478821)	0.0269
S5UTIL	-0.066272 (-0.409413)	0.157172 (1.026280)	-0.0014	0.195920 (0.842731)	0.353622 (1.605019)	0.0046	-0.066499 (-0.357796)	-0.504517[c] (-2.869149)	0.0114

Table 16.B: Unexpected component of CPI and MM method conditional to the business cycle by NBER's classification

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_L + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI), and D_H and D_L are dummy variables. D_H is equal to 1 when the economy is in expansion and it is equal to zero otherwise. D_L is equal to 1 when the economy is in contraction and it is equal to zero otherwise. ARS are calculated by market model method**.** The state of the economy is classified by NBER. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	CPIU (D_H)	CPIU (D_L)	R^2 Adj	CPIU (D_H)	CPIU (D_L)	R^2 Adj	CPIU (D_H)	CPIU (D_L)	R^2 Adj
S5ENRS	0.056954 (0.241894)	0.236268 (1.058423)	-0.0015	-0.399862 (-1.194029)	0.945554[c] (2.979359)	0.0292	0.112667 (0.468151)	-0.862867[c] (-3.781676)	0.0222
S5MATR	0.200636 (0.853099)	0.547106[b] (2.453659)	0.0085	0.077010 (0.236919)	0.245775 (0.797853)	-0.0049	-0.102070 (-0.469523)	-0.723159[c] (-3.508677)	0.0188
S5INDU	0.229557 (1.141589)	0.293162 (1.537727)	0.0030	-0.009068 (-0.031219)	0.220088 (0.799512)	-0.0051	-0.261685 (-1.402170)	-0.704846[c] (-3.983522)	0.0280
S5COND	0.234931 (0.871625)	0.998891[c] (3.908944)	0.0249	-0.109799 (-0.285769)	0.807138[b] (2.216645)	0.0107	-0.244559 (-0.987852)	-0.238486 (-1.016068)	-0.0001
S5CONS	0.293735 (1.522889)	0.514211[c] (2.811937)	0.0147	-0.030341 (-0.112069)	0.473919[a] (1.847113)	0.0051	-0.123218 (-0.700302)	-0.209902 (-1.258289)	0.0001
S5HLTH	0.151505 (0.648751)	0.732828[c] (3.309834)	0.0167	-0.126808 (-0.384757)	0.961081[c] (3.077035)	0.0269	-0.353537 (-1.564903)	-0.062790 (-0.293153)	0.0001
S5FINL	0.294061 (0.750010)	1.715604[c] (4.615290)	0.0348	-0.349005 (-0.640800)	1.954893[c] (3.787438)	0.0443	-0.244965 (-0.664268)	-0.386041 (-1.104140)	-0.0006
S5INFT	0.659392[a] (1.871013)	0.667910[b] (1.998955)	0.0099	-0.316104 (-0.559122)	0.696044 (1.299110)	-0.0001	0.275321 (0.826519)	-0.039447 (-0.124904)	-0.0024
S5TELS	0.232439 (0.908251)	0.950310[c] (3.916646)	0.0251	-0.223077 (-0.561042)	0.393673 (1.044742)	-0.0022	-0.525585[b] (-2.060169)	-0.342249 (-1.414991)	0.0076
S5UTIL	0.254755 (1.139754)	0.603848 (2.849499)	0.0133	0.631195[a] (1.852982)	0.832930[c] (2.580167)	0.0285	0.307508 (1.293181)	-0.069879 (-0.309956)	-0.0004

Tables 16.A and 16.B depict the results of the unexpected component of CPI with ARS calculated by MAR and MM, respectively, and conditional to the business cycle by NBER's classification. The results become consistent with the previous analysis: in the case of ARS calculated by MAR, the sectors show a negative and statistically significant response in post-event period. This response is very strong in all sectors. Instead, in the case of ARS calculated by MM, the response of the sectors is positive and statistically significant in pre-event period. The new result that we have obtained is that on announcement day, a great number of sectors has a significant response. Moreover, we can observe that all significant responses occur when the economy is in contraction.

Table 16.C: Unexpected component of PPI and MAR method conditional on the business cycle by NBER's classification

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_L + u_{it}$$

where π_t^u = PPIU (unexpected component of PPI), and D_H and D_L are dummy variables. D_H is equal to 1 when the economy is in expansion and it is equal to zero otherwise. D_L is equal to 1 when the economy is in contraction and it is equal to zero otherwise. ARS are calculated by mean-adjusted returns method. The state of the economy is classified by NBER. t-statistics are in parentheses: [a] p<0.1,[b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	PPIU (D_H)	PPIU (D_L)	R^2 Adj	PPIU (D_H)	PPIU (D_L)	R^2 Adj	PPIU (D_H)	PPIU (D_L)	R^2 Adj
S5ENRS	0.002989 (0.073575)	-0.089061 (-1.335144)	-0.0004	0.037394 (0.614992)	-0.025189 (-0.259207)	-0.0058	-0.028892 (-0.671358)	-0.048605 (-0.687862)	-0.0020
S5MATR	0.019341 (0.476666)	-0.032777 (-0.491966)	-0.0028	0.034407 (0.535349)	-0.189911[a] (1.848849)	0.0061	0.004202 (0.103414)	-0.019211 (-0.287916)	-0.0035
S5INDU	0.011417 (0.322591)	-0.024393 (-0.419746)	-0.0032	0.032391 (0.618179)	-0.144302[a] (1.723186)	0.0048	0.027127 (0.767261)	0.008407 (0.144811)	-0.0026
S5COND	0.028790 (0.752970)	-0.044717 (-0.712278)	-0.0017	0.018739 (0.350862)	-0.196547[b] (-2.302604)	0.0122	0.045803 (1.230369)	-0.001358 (-0.022223)	-0.0009
S5CONS	-0.032798 (-1.228230)	-0.025550 (-0.582719)	-0.0003	-0.017470 (-0.453837)	-0.074145 (-1.205194)	-0.0013	-0.001949 (-0.077925)	0.002123 (0.051700)	-0.0037
S5HLTH	-0.013671 (-0.447337)	0.000334 (0.006651)	-0.0033	0.017762 (0.369678)	-0.099783 (-1.299418)	-0.0007	-0.031480 (-0.973608)	0.030134 (0.567596)	-0.0014
S5FINL	-0.004136 (-0.084603)	0.013621 (0.169681)	-0.0036	0.028873 (0.352158)	-0.171940 (-1.312169)	-0.0006	0.010585 (0.189620)	0.021845 (0.238322)	-0.0035
S5INFT	0.033309 (0.700558)	-0.062011 (-0.794295)	-0.0016	0.043979 (0.620956)	-0.141116 (1.246689)	-0.0003	0.055588 (1.060806)	-0.109340 (-1.270782)	0.0013
S5TELS	-0.005118 (-0.148899)	-0.039212 (-0.694747)	-0.0027	0.002494 (0.047549)	-0.129628 (-1.546381)	0.0013	-0.025426 (-0.697121)	0.041252 (0.688823)	-0.0019
S5UTIL	0.026311 (0.911783)	-0.055003 (-1.160844)	0.0003	-0.029779 (-0.730519)	-0.002390 (-0.036679)	-0.0054	-0.003918 (-0.129016)	-0.061264 (-1.228524)	-0.0009

Table 16.D: Unexpected component of PPI and MM method conditional on the business cycle by NBER classification

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_L + u_{it}$$

where π_t^u = PPIU (unexpected component of PPI), and D_H and D_L are dummy variables. D_H is equal to 1 when the economy is in expansion and is equal to zero otherwise. D_L is equal to 1 when the economy is in contraction and is equal to zero otherwise. ARS are calculated by market model. The state of the economy is classified by NBER. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	PPIU (D_H)	PPIU (D_L)	R^2 Adj	PPIU (D_H)	PPIU (D_L)	R^2 Adj	PPIU (D_H)	PPIU (D_L)	R^2 Adj
S5ENRS	0.003986 (0.097705)	-0.076888 (-1.147678)	-0.0012	0.037394 (0.614992)	-0.025189 (-0.259207)	-0.0058	0.034592 (0.576830)	-0.037121 (-0.387305)	-0.0056
S5MATR	0.018527 (0.457462)	-0.025839 (-0.388569)	-0.0030	0.034407 (0.535349)	-0.189911[a] (1.848849)	0.0061	0.036215 (0.569286)	-0.199560[b] (-1.962849)	0.0078
S5INDU	0.010519 (0.297760)	-0.014924 (-0.257283)	-0.0034	0.032391 (0.618179)	-0.144302[a] (1.723186)	0.0048	0.034700 (0.673473)	-0.160385[a] (1.947674)	0.0080
S5COND	0.027899 (0.730790)	-0.034865 (-0.556191)	-0.0021	0.018739 (0.350862)	-0.196547[b] (-2.302604)	0.0122	0.024650 (0.470390)	-0.206022[b] (-2.459942)	0.0152
S5CONS	-0.032288 (-1.213148)	-0.021793 (-0.498685)	-0.0005	-0.017470 (-0.453837)	-0.074145 (-1.205194)	-0.0013	-0.017561 (-0.453958)	-0.086432 (-1.397981)	0.0005
S5HLTH	-0.012586 (-0.413453)	0.007841 (0.156875)	-0.0033	0.017762 (0.369678)	-0.099783 (-1.299418)	-0.0007	0.018426 (0.383556)	-0.110252 (-1.435959)	0.0007
S5FINL	-0.006172 (-0.123585)	0.034280 (0.418067)	-0.0033	0.028873 (0.352158)	-0.171940 (-1.312169)	-0.0006	0.031794 (0.389093)	-0.209400 (-1.603455)	0.0025
S5INFT	0.035123 (0.739517)	-0.049506 (-0.634825)	-0.0019	0.043979 (0.620956)	-0.141116 (1.246689)	-0.0003	0.045852 (0.649292)	-0.159112 (-1.409798)	0.0014
S5TELS	-0.004387 (-0.127263)	-0.034205 (-0.604257)	-0.0030	0.002494 (0.047549)	-0.129628 (-1.546381)	0.0013	0.003736 (0.071336)	-0.140275[a] (-1.675684)	0.0029
S5UTIL	0.025070 (0.864798)	-0.046275 (-0.972182)	-0.0006	-0.029779 (-0.730519)	-0.002390 (-0.036679)	-0.0054	-0.032641 (-0.792663)	-0.011484 (-0.174500)	-0.0050

Tables 16.C and 16.D collect the results of the unexpected component of PPI with ARS calculated by MAR and MM, respectively, and conditional to the business cycle by NBER's classification. The results are consistent with the previous analysis. The stock returns hardly respond to PPI announcements. We only can find some significant responses on announcement day with ARS calculated by both methods, and on post-event period, for ARS calculated by MM. The sectors that show a significant response to PPI announcements are S5MATR, S5INDU and S5COND. These responses are very weak in all cases and always occur when the economy is in contraction.

Table 16.E: Unexpected component of CPI and MAR method conditional to the business cycle by McQueen and Roley's methodology

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_M + \beta_{3i}\pi_t^u * D_L + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI) and D_H, D_M and D_L are dummy variables. D_H is equal to 1 when the economy is in high state, D_M is equal to 1 when the economy is in medium state and D_L is equal to 1 when the economy is in low state. The value of these variables is zero otherwise. ARS are calculated by mean-adjusted returns. The state of the economy is classified by McQueen and Roley classification. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	CPIU (D_H)	CPIU (D_M)	CPIU (D_L)	CPIU (D_H)	CPIU (D_M)	CPIU (D_L)	CPIU (D_H)	CPIU (D_M)	CPIU (D_L)
S5ENRS	0.029372	0.542847	-0.049116	-0.330834	3.107507[c]	-0.709510[a]	0.117340	-2.197001[c]	0.125724
	(0.120217)	(1.541169)	(-0.175347)	(-1.041798)	(6.687640)	(-1.941191)	(0.479531)	(-6.227911)	(0.448159)
R^2. Adj	-0.0011			0.1477			0.0616		
S5MATR	0.242204	1.155751[c]	0.015327	0.174969	2.066272[c]	-1.077210[c]	-0.177826	-1.706249[c]	0.068933
	(0.992980)	(3.286737)	(0.054808)	(0.548474)	(4.492786)	(-2.933807)	(-0.799932)	(-5.324029)	(0.270476)
R^2. Adj	0.0157			0.0864			0.0452		
S5INDU	0.3436666[a]	0.771117[b]	-0.223260	0.102389	1.661455[c]	-0.912189[c]	-0.426038[b]	-1.531148[c]	0.093542
	(1.645151)	(2.560634)	(-0.932228)	(0.358483)	(4.034198)	(-2.774813)	(-2.220996)	(-5.536792)	(0.425351)
R^2. Adj	0.0128			0.0710			0.0563		
S5COND	0.416914[a]	0.870862[c]	-0.256093	0.178815	1.155889[c]	-0.876979[b]	-0.529171[c]	-1.829103[c]	0.121218
	(1.868635)	(2.707501)	(-1.001191)	(0.593285)	(2.660157)	(-2.528035)	(-2.743709)	(-6.578420)	(0.548216)
R^2. Adj	0.0158			0.0377			0.0805		
S5CONS	0.261232[a]	0.159169	0.007271	-0.071287	0.936023[c]	-0.572488[b]	-0.289537[b]	-1.174305[c]	0.037630
	(1.668901)	(0.705347)	(0.040520)	(-0.341684)	(3.111940)	(-2.384044)	(-2.111944)	(-5.941559)	(0.239414)
R^2. Adj	0.0005			0.0431			0.0628		
S5HLTH	0.212308	0.339133	0.119335	0.040762	1.625036[c]	-0.567029[b]	-0.522789[c]	-1.203443[c]	0.153892
	(1.136663)	(1.259435)	(0.557279)	(0.166197)	(4.595800)	(-2.008660)	(-3.051742)	(-4.872900)	(0.783574)
R^2. Adj	0.0003			0.0743			0.0529		
S5FINL	0.568616[a]	1.566400[c]	-0.265819	-0.119743	3.125605[c]	-0.922895[b]	-0.730061[b]	-2.626307[c]	0.152481
	(1.869390)	(3.572106)	(-0.762269)	(-0.274453)	(4.969192)	(-1.837837)	(-2.350770)	(-5.865944)	(0.428261)
R^2. Adj	0.0246			0.0834			0.0633		
S5INFT	0.486913	0.524012	0.001659	-0.346000	1.420532[b]	-0.863462[a]	-0.054698	-1.138057[c]	0.169459
	(1.791703)	(1.337509)	(0.005325)	(-0.771283)	(2.196448)	(-1.672307)	(-0.202618)	(-2.924220)	(0.547535)
R^2. Adj	0.0036			0.0184			0.0106		
S5TELS	0.464466[b]	1.073725[c]	-0.044715	-0.099856	0.739769	-0.576918	-0.614227[c]	-1.614667[c]	0.124673
	(2.208634)	(3.541637)	(-0.185464)	(-0.313881)	(1.612943)	(-1.575576)	(-2.941769)	(-5.364184)	(0.520825)
R^2. Adj	0.0256			0.0077			0.0594		
S5UTIL	0.030327	0.453277	-0.175475	0.289658	1.367305[c]	-0.432103	-0.008548	-1.551081[c]	0.117566
	(0.182401)	(1.891068)	(-0.920575)	(1.247962)	(4.086147)	-1.617480	(-0.045636)	(-5.743926)	(0.547464)
R^2. Adj	0.0026			0.0608			0.0521		

Tables 16.E and 16.F show the results of the unexpected component of CPI with ARS calculated by MAR and MM, respectively, and conditional to the business cycle by McQueen and Roley's classification. The results obtained in this section are less clear than the results obtained formerly. We can observe significant responses in pre-event, post-event and announcement day. Besides, the significant responses happen when the economy is in expansion. When the economy is in contraction, we can find significant effects only on announcement day.

Table 16.F: Unexpected component of CPI and MM method conditional to the business cycle by McQueen and Roley's methodology

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_M + \beta_{3i}\pi_t^u * D_L u_{it}$$

where π_t^u = CPIU (unexpected component of CPI) and D_H, D_M and D_L are dummy variables. D_H is equal to 1 when the economy is in high state, D_M is equal to 1 when the economy is in medium state and D_L is equal to 1 when the economy is in low state. The value of these variables is zero otherwise. ARS are calculated by market model. The state of the economy is classified by McQueen and Roley. t-statistics are in parentheses: [a] p<0.1,[b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	CPIU (D_H)	CPIU (D_M)	CPIU (D_L)	CPIU (D_H)	CPIU (D_M)	CPIU (D_L)	CPIU (D_H)	CPIU (D_M)	CPIU (D_L)
S5ENRS	0.090360	0.607826[a]	-0.059615	-0.244685	3.125367[c]	-0.758698[b]	0.121891	-2.242158[c]	0.082533
	(0.373228)	(1.741481)	(-0.214065)	(-0.757336)	(6.709886)	(-2.040263)	(0.503321)	(-6.422162)	(0.296275)
R^2. Adj	0.0004			0.1447			0.0654		
S5MATR	0.270501	1.217811[c]	-0.001449	0.201475	2.108375[c]	-1.125277[c]	-0.170788	-1.728061[c]	0.058856
	(1.122347)	(3.508054)	(-0.05232)	(0.634534)	(4.605899)	(-3.079136)	(-0.774567)	(-5.436278)	(0.232052)
R^2. Adj	0.0188			0.0924			0.0471		
S5INDU	0.349530[a]	0.872965[c]	-0.241944	0.113769	1.744607[c]	-0.936876[c]	-0.426671[b]	-1.556605[c]	0.093268
	(1.701010)	(2.946867)	(-1.023603)	(0.397717)	(4.230388)	(-2.845559)	(-2.258540)	(-5.715507)	(0.429205)
R^2. Adj	0.0172			0.0774			0.0598		
S5COND	0.492303[a]	1.579594[c]	0.226808	0.251219	1.852805[c]	-0.411945	-0.410812	-1.224528[c]	0.612581[b]
	(1.778257)	(3.957754)	(0.712224)	(0.643006)	(3.289459)	(-0.916087)	(-1.634975)	(-3.380479)	(2.119465)
R^2. Adj	0.0288			0.0317			0.0276		
S5CONS	0.362989[a]	0.619543[b]	0.337889	0.086680	1.368892[c]	-0.293016	-0.242623	-0.825053[c]	0.348844[a]
	(1.826817)	(2.162790)	(1.478325)	(0.316247)	(3.464234)	(-0.928822)	(-1.351112)	(-3.194074)	(1.692578)
R^2. Adj	0.0129			0.0347			0.0212		
S5HLTH	0.244460	0.820480[b]	0.508529[b]	0.129007	2.094037[c]	-0.187017	-0.470031[b]	-0.807286[b]	0.545739[b]
	(1.014871)	(2.362723)	(1.835330)	(0.386613)	(4.352925)	(-0.486945)	(-2.041208)	(-2.431807)	(2.060348)
R^2. Adj	0.0125			0.0558			0.0202		
S5FINL	0.750565[b]	2.416224[c]	0.551747	0.164334	3.927193[c]	-0.165264	-0.486925	-1.873493[c]	0.897656[b]
	(1.858724)	(4.150546)	(1.187850)	(0.297966)	(4.939178)	(-0.260347)	(-1.300776)	(-3.471634)	(2.084710)
R^2. Adj	0.0335			0.0723			0.0267		
S5INFT	0.774281[b]	1.115610[b]	0.228316	0.042362	1.965367[b]	-0.670094	0.293205	0.700105	0.383749
	(2.136417)	(2.135212)	(0.547670)	(0.073371)	(2.361173)	(-1.008377)	(0.856752)	(-1.419016)	(0.974823)
R^2. Adj	0.0115			0.0127			0.0012		
S5TELS	0.337307	1.876142[c]	0.163428	-0.214935	1.514085[c]	-0.381429	-0.771489[c]	-0.896750[b]	0.324804
	(1.291461)	(4.982673)	(0.543972)	(-0.530913)	(2.594176)	(-0.818588)	(-2.960391)	(-2.386887)	(1.083516)
R^2. Adj	0.0414			0.0165			0.0225		
S5UTIL	0.397957[a]	0.927433[c]	0.179811	0.840032[b]	1.802696[c]	-0.081013	0.461614[a]	-1.220837[c]	0.490988[a]
	(1.731237)	(2.798617)	(0.680034)	(2.432817)	(3.621335)	-0.203848	(1.913828)	(-3.510936)	(1.769659)
R^2. Adj	0.0148			0.0551			0.0283		

Instead, the results with McQueen and Roley methodology are consistent with those reached in McQueen and Roley (1993), Andersen *et al*. (2007) and Cenesizoglu (2011). They find that CPI reveals important information about stock returns in expansions. Therefore, our results are not robust to the choice of the business cycle indicator. We obtain different responses when we estimate with NBER or McQueen and Roley classification. This fact can be due to NBER classification considers recession periods shorter than McQueen and Roley classification. Anyway, both classifications are consistent with results for CPI and PPI. The market reacts to CPI announcements. Once again, our analysis allows us to confirm that PPI announcements have not a significant reaction on the market.

Table 16.G: Unexpected component of PPI and MAR method conditional to the business cycle by McQueen and Roley's methodology

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_M + \beta_{3i}\pi_t^u * D_L + u_{it}$$

where π_t^u = PPIU (unexpected component of PPI) and D_H, D_M and D_L are dummy variables. D_H is equal to 1 when the economy is in high state, D_M is equal to 1 when the economy is in medium state and D_L is equal to 1 when the economy is in low state. The value of these variables is zero otherwise. ARS are calculated by mean-adjusted returns model. The state of the economy is classified by McQueen and Roley. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	PPIU (D_H)	PPIU (D_M)	PPIU (D_L)	PPIU (D_H)	PPIU (D_M)	PPIU (D_L)	PPIU (D_H)	PPIU (D_M)	PPIU (D_L)
S5ENRS	-0.012862	-0.143198	-0.010405	0.084567	0.368471[b]	-0.036255	0.060299	-0.059884	-0.052223
	(-0.150846)	(-1.193678)	(-0.259816)	(0.687078)	(2.127928)	(-0.610837)	(0.668523)	(-0.471899)	(-1.232698)
R^2. Adj	-0.0027			0.0084			-0.0015		
S5MATR	0.059560	-0.106030	0.005652	0.044183	0.044184	-0.054244	0.057530	0.052723	-0.021413
	(0.700049)	(-0.885804)	(0.141432)	(0.334873)	(0.238035)	(-0.852563)	(0.675197)	(0.439817)	(-0.535060)
R^2. Adj	-0.0031			-0.0078			-0.0038		
S5INDU	0.011470	-0.017760	0.0017447	-0.010733	0.169751	-0.040849	0.063166	0.031511	0.011937
	(0.154418)	(-0.169945)	(0.050086)	(-0.100033)	(1.124510)	(-0.789464)	(0.851686)	(0.301996)	(0.342678)
R^2. Adj	-0.0054			-0.0042			-0.0038		
S5COND	0.028123	-0.083033	0.014900	-0.037522	0.038953	-0.052345	0.082010	0.073151	0.017763
	(0.350447)	(-0.735435)	(-0.395307)	(-0.341327)	(0.251872)	(-0.987435)	(1.050144)	(0.565767)	(0.484259)
R^2. Adj	-0.0040			-0.0069			-0.0023		
S5CONS	-0.072132	-0.066333	-0.017769	-0.034964	0.081473	-0.046558	0.036150	0.080175	-0.018041
	(1.288426)	(-0.842169)	(-0.675747)	(-0.445205)	(0.737387)	(-1.229352)	(0.690141)	(1.087927)	(-0.733283)
R^2. Adj	-0.0004			-0.0029			-0.0015		
S5HLTH	-0.000942	-0.026939	-0.009951	0.008784	0.085230	-0.032737	-0.046180	0.032142	-0.013115
	(-0.014692)	(-0.298596)	(-0.330394)	(0.089350)	(0.616256)	(-0.690559)	(-0.680314)	(0.336563)	(-0.411359)
R^2. Adj	-0.0052			-0.0080			-0.0041		
S5FINL	-0.030338	0.164623	-0.010763	0.067228	0.211165	-0.077765	0.112841	-0.037623	-0.002544
	(-0.296110)	(1.142059)	(-0.223665)	(0.401505)	(0.896413)	(-0.963093)	(0.964093)	(-0.228474)	(-0.046270)
R^2. Adj	-0.0029			-0.0042			-0.0037		
S5INFT	0.014398	-0.284243[b]	0.038512	0.024476	0.086104	-0.026759	-0.006852	-0.135076	0.001045
	(0.144795)	(2.031828)	(0.824606)	(0.168717)	(0.421877)	(-0.382506)	(-0.062205)	(0.871586)	(0.020190)
R^2. Adj	0.0033			-0.0099			-0.0041		
S5TELS	0.010286	-0.013867	-0.019833	0.108839	-0.000523	-0.072090	0.027730	-0.056300	-0.009674
	(0.142591)	(-0.136633)	(-0.585370)	(1.017084)	(-0.003476)	(-1.396993)	(0.362161)	(-0.522638)	(-0.269007)
R^2. Adj	-0.0048			-0.0002			-0.0046		
S5UTIL	0.013271	-0.007427	0.003633	-0.051658	0.190418	-0.040153	0.039536	-0.006132	-0.033934
	(0.218747)	(0.087017)	(0.127508)	(-0.624459)	(1.636154)	(-1.006553)	(0.620455)	(-0.068396)	(-1.133812)
R^2. Adj	-0.0054			0.0037			-0.0025		

Table 16.H: Unexpected component of PPI and MM method conditional on the business cycle by McQueen and Roley's methodology

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H + \beta_{2i}\pi_t^u * D_M + \beta_{3i}\pi_t^u * D_L + u_{it}$$

where π_t^u = PPIU (unexpected component of PPI) and D_H, D_M and D_L are dummy variables. D_H is equal to 1 when the economy is in high state, D_M is equal to 1 when the economy is in medium state and D_L is equal to 1 when the economy is in low state. The value of these variables is zero otherwise. ARS are calculated by market model. The state of the economy is classified by McQueen and Roley. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	Pre – Event			Announcement day			Post - Event		
	PPIU (D_H)	PPIU (D_M)	PPIU (D_L)	PPIU (D_H)	PPIU (D_M)	PPIU (D_L)	PPIU (D_H)	PPIU (D_M)	PPIU (D_L)
S5ENRS	-0.009131	-0.113413	-0.009190	0.064596	-0.040043	-0.062172	0.068065	0.367913[b]	-0.039602
	(-0.106620)	(-0.941234)	(-0.228468)	(0.713596)	(-0.314422)	(-1.462279)	(0.560699)	(2.154260)	(-0.676509)
R^2. Adj	-0.0038			0.0084			0.0085		
S5MATR	0.055596	-0.081615	0.005515	0.057622	0.061969	-0.029558	0.037474	0.038877	-0.053973
	(0.654542)	(-0.682971)	(0.138240)	(0.676328)	(0.516987)	(-0.738655)	(0.286690)	(0.211412)	(-0.856271)
R^2. Adj	-0.0038			-0.0078			-0.0080		
S5INDU	0.003627	0.024485	0.001310	0.065218	0.052403	0.006112	-0.014933	0.156401	-0.042174
	(0.048927)	(0.234750)	(0.037628)	(0.880275)	(0.502742)	(0.175649)	(-0.141275)	(1.051749)	(-0.827397)
R^2. Adj	-0.0054			-0.0042			-0.0045		
S5COND	0.020272	-0.044983	0.015078	0.083049	0.083868	0.011126	-0.026775	0.037949	-0.052593
	(0.252943)	(-0.398954)	(0.400565)	(1.060642)	(0.761323)	(0.302516)	(-0.247862)	(0.249701)	(-1.009594)
R^2. Adj	-0.0048			-0.0069			-0.0069		
S5CONS	-0.072420	-0.035541	-0.019287	0.042908	0.094832	-0.023784	-0.046427	0.082913	-0.048818
	(-1.297562)	(-0.452629)	(-0.735749)	(0.829577)	(1.303192)	(-0.979003)	(-0.588015)	(0.746428)	(-1.282169)
R^2. Adj	-0.0011			-0.0029			-0.0018		
S5HLTH	-0.002170	-0.002235	-0.008673	-0.043991	0.042446	-0.020757	0.003831	0.087122	-0.035140
	(-0.033975)	(-0.024867)	(-0.289063)	(-0.644370)	(0.441918)	(-0.647334)	(0.038950)	(0.629685)	(-0.740959)
R^2. Adj	-0.0054			-0.0080			-0.0077		
S5FINL	-0.043664	0.216881	-0.008177	0.117121	-0.003070	-0.024567	0.063701	0.173638	-0.083934
	(-0.417517)	(1.474035)	(-0.166478)	(1.005874)	(-0.018738)	(-0.449206)	(0.381038)	(0.738270)	(-1.041140)
R^2. Adj	-0.0012			-0.0042			-0.0046		
S5INFT	0.008639	-0.235410[b]	0.040669	-0.004306	0.148761	-0.006267	0.022149	0.088308	-0.031498
	(0.084175)	(-1.683009)	(0.870927)	(-0.038935)	(0.956069)	(-0.120641)	(0.153008)	(0.433617)	(-0.451216)
R^2. Adj	0.0010			-0.0099			-0.0096		
S5TELS	0.007683	0.019698	-0.020485	0.029273	-0.047753	-0.015662	0.104840	0.009511	-0.075178
	(0.106207)	(0.193551)	(-0.602915)	(0.380034)	(-0.440652)	(-0.432918)	(0.980496)	(-0.063225)	(-1.458005)
R^2. Adj	-0.0048			-0.0002			0.0002		
S5UTIL	0.009262	0.022379	0.003136	0.043588	0.009179	-0.039273	-0.074560	0.193645[a]	-0.041437
	(0.152047)	(0.261115)	(0.109604)	(0.681799)	(0.102054)	(-1.307882)	(-0.892826)	(1.648217)	(-1.028947)
R^2. Adj	-0.0053			0.0037			0.0055		

4.3 Model conditional to the business cycle and the direction of the inflation news

In order to complete our analysis, we propose to introduce the direction of the inflation news in the model. The literature distinguishes between positive inflation news (total inflation higher than the expected inflation) and negative inflation news (total inflation lower than the expected inflation). Positive inflation news are considered as "bad news" and negative inflation news are considered as"good news". Previous studies corroborate that this variable has an important effect on stock returns. Andersen *et al*. (2003) affirm that "bad news" cause a greater impact than "good news". On the other hand, the famous "market direction" hypothesis (MHD) of Veronesi (1999) defends that the impact of macroeconomic announcements depends on the economic context. Therefore, the state of the economy and the direction of the surprises are two relevant factors that may influence in investors. Following Knif *et al*. (2008), the investors believe that an announcement is "good news" or "bad news" depending on the state of the economy, and therefore, the effect of inflation news on common stock returns can be very different in each scenario. Díaz and Jareño (2009, 2012) also corroborate this theory.

We modify equation (11) once again and introduce four dummy variables. D_{+}^{H} and D_{-}^{H} are equal to 1 when the state of the economy is high and the direction of the inflation news is positive and negative, respectively. D_{+}^{L} and D_{-}^{L} are equal to 1 when the state of the economy is low and the direction of the inflation news is positive and negative, respectively.

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H^+ + \beta_{2i}\pi_t^u * D_H^- + \beta_{3i}\pi_t^u * D_L^+ + \beta_{4i}\pi_t^u * D_L^- + u_{it} \qquad (14)$$

Table 17

Response to CPI and PPI announcements conditional to the business cycle and taking into account the direction of the inflation surprise

17.A.- Unexpected component of CPI and MAR method conditional to the business cycle by NBER methodology taking into account the direction of the surprise

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H^+ + \beta_{2i}\pi_t^u * D_H^- + \beta_{3i}\pi_t^u * D_L^+ + \beta_{4i}\pi_t^u * D_L^- + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI) and D_H^+, D_H^-, D_L^+, D_L^- are dummy variables. D_+^H and D_-^H are equal to 1 when the state of the economy is high and the direction of the inflation news is positive and negative, respectively. D_+^L and D_-^L are equal to 1 when the state of the economy is low and the direction of the inflation news is positive and negative, respectively. The state of the economy is classified by NBER. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	S5ENRS	S5MATR	S5INDU	S5COND	S5CONS	S5HLTH	S5FINL	S5INFT	S5TELS	S5UTIL
PRE – EVENT										
D_+^H	-0.454012	-0.270917	-0.082457	-0.255915	-0.125581	-0.191634	-0.167442	0.180083	-0.196617	-0.119110
	(-1.11191)	(0.66257)	(-0.23517)	(-0.68385)	(-0.48047)	(-0.61449)	(-0.32691)	(0.39637)	(-0.55874)	(-0.42792)
D_-^H	0.399560	0.544546	0.484359	0.608938[a]	0.521817[b]	0.546766[a]	0.619776	0.866321	0.670839	-0.020056
	(1.06859)	(1.45433)	(1.50871)	(1.77693)	(2.18016)	(1.91458)	(1.32140)	(2.08229)	(2.081793)	(-0.07868)
D_+^L	-0.111334	0.104498	-0.164546	-0.152691	-0.013768	0.112604	0.265197	0.004145	-0.035744	-0.138390
	(0.30537)	(0.28622)	(-0.52565)	(-0.45696)	(-0.05899)	(0.40439)	(0.57988)	(0.01021)	(-0.11949)	(-0.556829)
D_-^L	0.474381	0.881813[c]	0.599397[b]	0.761892[c]	0.187263	0.303366	1.082915[c]	0.251468	1.033211[c]	0.381703
	(1.50943)	(2.801935)	(2.22129)	(2.64511)	(0.93084)	(1.26384)	(0.006)	(0.71911)	(3.81472)	(1.78167)
ANNOUNCEMENT										
D_+^H	0.044494	0.788698	0.430219	-0.270773	0.282016	0.084148	-0.306660	0.331231	0.086555	0.547286
	(0.08142)	(1.46014)	(0.89062)	(-0.53947)	(0.81422)	(0.20409)	(-0.41639)	(0.44939)	(0.16609)	(1.41061)
D_-^H	-0.925355[a]	-0.561673	-0.372548	0.094503	-0.499198	-0.224075	-0.541117	-1.033547	-0.448198	-0.109680
	(-1.84369)	(-1.13223)	(-0.83975)	(0.20501)	(-1.56931)	(-0.59174)	(-0.80004)	(-1.52684)	(-0.93651)	(-0.30781)
D_+^L	0.315102	-0.303925	0.097397	0.061921	-0.154571	-0.046625	1.091926	0.272582	-0.174811	0.144608
	(0.649877)	(-0.63419)	(0.22725)	(0.13905)	(-0.50299)	(-0.12742)	(1.67114)	(0.41683)	(-0.37810)	(0.420100)
D_-^L	1.388952[c]	0.596972	0.226130	0.187846	0.223121	0.717122[b]	0.89133	-0.05649	0.157153	0.484015[a]
	(3.45421)	(1.50206)	(0.63622)	(0.508642)	(0.87549)	(2.36381)	(1.644892)	(-0.10417)	(0.40987)	(1.69552)
POST – EVENT										
D_-^H	0.377794	-0.163830	-0.025539	-0.120220	-0.156564	-0.326142	-0.046782	0.541323	-0.441639	0.301861
	(0.91969)	(-0.44779)	(-0.07911)	(-0.370011)	(-0.67869)	(-1.12767)	(-0.089840)	(1.20483)	(-1.26261)	(0.95469)
D_-^H	-0.125763	-0.051485	-0.463607	-0.392917	-0.139753	-0.257977	-0.559971	-0.076337	-0.491379	-0.387583
	(-0.33433)	(-0.15091)	(-1.56817)	(-1.32059)	(-0.66156)	(-0.97407)	(-1.17438)	(-0.18554)	(-1.53408)	(-1.33860)
D_+^L	0.530205	0.244589	0.080806	0.046132	-0.034470	-0.064035	0.132939	0.310132	0.340668	0.329047
	(1.445543)	(0.73525)	(0.28030)	(0.159017)	(-0.16735)	(-0.24797)	(0.28592)	(0.773063)	(1.090766)	(1.16550)
D_-^L	-1.834969[c]	-1.422382[c]	-1.283390[c]	-1.578748[c]	-0.968440[c]	-0.958098[c]	-2.395193[c]	-1.281727[c]	-1.447610[c]	-1.146512[c]
	(-5.80363)	(-4.96019)	(-5.16482)	(-6.31296)	(-5.45427)	(-4.30399)	(-5.97609)	(-3.70636)	(-5.37695)	(-4.71107)

17. B. - Unexpected component of CPI and MM method conditional on the business cycle by NBER methodology taking into account the direction of the surprise

This table reports the results of this regression:

$$ARS_i(t) = \alpha_i + \beta_{1i}\pi_t^u * D_H^+ + \beta_{2i}\pi_t^u * D_H^- + \beta_{3i}\pi_t^u * D_L^+ + \beta_{4i}\pi_t^u * D_L^- + u_{it}$$

where π_t^u = CPIU (unexpected component of CPI) and D_H^+, D_H^-, D_L^+, D_L^- are dummy variables. D_+^H and D_-^H are equal to 1 when the state of the economy is high and the direction of the inflation news is positive and negative, respectively. D_+^L and D_-^L are equal to 1 when the state of the economy is low and the direction of the inflation news is positive and negative, respectively. The state of the economy is classified by NBER. t-statistics are in parentheses: [a] p<0.1, [b] p<0.05, [c] p<0.01

	S5ENRS	S5MATR	S5INDU	S5COND	S5CONS	S5HLTH	S5FINL	S5INFT	S5TELS	S5UTIL
PRE – EVENT										
D_+^H	-0.379403	-0.251267	-0.085065	-0.766753	-0.208605	-0.406423	-0.515718	0.095498	-0.913840[b]	-0.548198
	(-0.93683)	(-0.62179)	(-0.24635)	(-1.66126)	(-0.629975)	(-1.01372)	(-0.76529)	(0.15744)	(-2.106401)	(-1.433081)
D_-^H	0.436746	0.594061	0.503607	1.106421[c]	0.730455[b]	0.636472[a]	0.997958	1.150190[b]	1.230281[c]	0.953484[c]
	(1.17773)	(1.60545)	(1.59273)	(2.61792)	(2.409053)	(1.73369)	(1.61726)	(2.070863)	(3.096915)	(2.72208)
D_+^L	-0.124313	0.061968	-0.199039	0.551940	-0.651265[b]	0.970846[c]	2.045603[c]	0.200882	-0.165481	0.092705
	(-0.34391)	(0.17181)	(-0.64579)	(1.33978)	(-2.20352)	(2.713003)	(3.40089)	(0.371048)	(-0.42735)	(0.271515)
D_-^L	0.527463[a]	0.933633[c]	0.679725[b]	1.377750[c]	0.429506[a]	0.573499	1.496110[c]	1.045018[b]	1.843459[c]	1.023801[c]
	(1.68372)	(2.98678)	(2.54475)	(3.85894)	(1.676809)	(1.849216)	(2.87006)	(2.22724)	(5.493124)	(3.45991)
ANNOUNCEMENT										
D_+^H	-0.735553	0.306809	0.114314	-0.753515	-0.206312	-0.535111	-0.674895	-0.212394	-1.319801[b]	-0.492647
	(-1.35405)	(0.59064)	(0.245635)	(-1.206550)	(-0.46987)	(-0.992568)	(-0.754251)	(-0.22778)	(-2.042920)	(-0.89656)
D_-^H	1.563968[c]	0.993830[c]	0.876487[c]	1.363040[c]	0.735509	1.167571[c]	2.232622[c]	0.863744	1.215596[c]	1.821706[c]
	(4.12751)	(2.74286)	(2.70008)	(3.128971)	(2.401488)	(3.10483)	(3.62471)	(1.32799)	(2.69756)	(4.75293)
D_+^L	-1.100271[b]	-1.198434[b]	-1.038086[b]	0.152104	0.359589	0.583199	0.618724	-0.573384	-0.696012	-0.049178
	(-2.07551)	(-2.36414)	(-2.28577)	(0.249574)	(0.839202)	(1.10851)	(0.70857)	(-0.63012)	(-1.10399)	(-0.09171)
D_-^L	0.117194	-1.221892	-1.072041	-0.907994	-1.265253[b]	-0.709058	-1.224986	-0.030310	0.262531	0.506435
	(0.148037)	(1.614096)	(-1.58069)	(-0.997655)	(-1.97731)	(0.90249)	(-0.93941)	(-0.02231)	(0.27885)	(0.632428)
POST – EVENT										
D_+^H	0.405398	-0.118561	-0.037859	-0.533414	-0.261711	-0.574205	-0.313903	0.402396	-1.278938[c]	-0.175835
	(0.99566)	(-0.32056)	(-0.11896)	(-1.26917)	(-0.877964)	(-1.49248)	(-0.50610)	(0.70210)	(-2.93335)	(-0.43291)
D_-^H	-0.143093	-0.088605	-0.457043	0.005641	-0.003560	-0.162457	-0.187023	0.164257	0.129086	0.727215
	(-0.38379)	(-0.26162)	(-1.56837)	(0.01466)	(-0.01304)	(-0.46114)	(-0.32929)	(-0.31299)	(0.32333)	(1.95527)
D_+^L	0.449964	0.236875	0.078306	0.852232[b]	0.644140[b]	0.834083	1.816414[c]	0.572831	0.161447	0.607826[a]
	(1.23814)	(0.71753)	(0.27567)	(2.271811)	(2.42099)	(2.42891)	(3.28107)	(1.11979)	(0.41486)	(1.67660)
D_-^L	-1.872689[c]	-1.452650[c]	-1.309756[c]	-1.056777[c]	-0.854040[c]	-0.736307[c]	-2.058388[c]	-0.510040[c]	-0.696036[b]	-0.566502[a]
	(-5.94582)	(-5.07737)	(-5.31796)	(-3.250018)	(-3.70379)	(-2.47409)	(-4.29025)	(-1.15045)	(-2.06377)	(-1.80305)

Tables 17.A and 17.B show the effect of unexpected component of CPI on abnormal returns calculated by MAR and MM, conditional to the business cycle by NBER classification and taking into account the direction of the surprise. The main conclusion that we can deduce is that in both cases the market reaction is very strong two days later the announcement in contraction periods to positive news. The market also reacts to negative news in contraction periods. In expansions periods, the market hardly reacts to good news and bad news.[23]

[23]We also have estimated the results with McQueen and Roley methodology, but the results are less clear and, therefore, we not show the tables. The results for PPI shoy the same conclusion that in previous analysis: PPI announcements not cause significant responses in the market. We do not show the talbes.

5 Summary and concluding remarks

This study tries to measure the response of abnormal returns to inflation announcements. Our period of analysis is from January 1990 until April 2013. Working with daily data of S&P500 Index, we estimate the effect of CPI and PPI announcements on sectoral returns. Our analysis not only is focused on announcement day; we also analyze the returns two days before the announcement and two days later. In this way, we can measure the efficiency of the market.

Previous studies consider that the effect of inflation news of common stock returns depend on the state of the economy and the direction of the inflation surprises. Firstly, we make a preliminary analysis of the abnormal returns by sector. Abnormal returns have been calculated by two different models: mean adjusted returns (MAR) and market model (MM). The aim consists of confirming the results obtained by both methods. Moreover, we utilize two different classifications of the business cycle: National Bureau of Economic Research (NBER) and McQueen and Roley's methodology.

Our model is composed in three parts. Firstly, we calculate the model non conditional to the business cycle. Secondly, we introduce the state of the economy and, finally, we take into account the state of the economy and the direction of the inflation surprises. The first model shows a few significant responses for CPI and hardly significant responses for PPI. Instead, when we introduce in our model the state of the economy, the majority of the sectors respond to CPI news. Moreover, we can observe that the majority of significant responses occur two days later the announcement. Therefore, we conclude that the market react later to the arrival of new information. PPI news not cause any significant effect on the market. The third model takes into account the state of the economy and the direction of the inflation surprises. We observe the significant impact of inflation surprises on abnormal returns in post-event period. Moreover, CPI announcements cause a great impact when the state of the economy is low and when the direction of the news is positive.

We can conclude that our analysis is quite consistent with previous analysis. The state of the economy and the direction of the surprises are very important variables in order to measure the effect of inflation news on abnormal returns.

6 References

- Adams, G. L., MaCqueen, G., & Wood, R. (2004). The effects of inflation news on high frequency stock returns. *Journal of Business,* 77 (3), 547-574.
- Anari, A., & Kolari, J. (2001). Stock prices and inflation. *The Journal of Financial Research*, 24(4), 587-602.
- Andersen, T. G., Bollerslev, T., Diebold, F. X., & Vega, C. (2002). Micro Effects of Macro Announcements: Real – Time Price Discovery in Foreign Exchange. *National Bureau of Economic Research*. Working Paper 8959.
- Andersen, T. G., Bollerslev, T., Diebold, F. X., & Vega, C. (2007). Real-time price discovery in global stock, bond and foreign exchange markets. *Journal of International Economics*, *73*(2), 251-277.
- Asikoglu, Y. & Erkan, M. R. (1992). Inflation flow – through and stock prices. *Journal of Portfolio Management*, 18(3), 63-68.
- Bakshi, G. S., & Chen, Z. (1996). Inflation, asset prices, and the term structure of interest rates in monetary economies. *Review of Financial Studies*, 9(1), 241-275.
- Balduzzi, P. (1995). Stock returns, inflation, and the proxy hypothesis: a new look at the data. *Economics Letters*, 48(1), 47-53.
- Beechey, M. J., & Wright, J. H. (2009). The high-frequency impact of news on long-term yields and forward rates: Is it real?. *Journal of Monetary Economics*, *56*(4), 535-544.
- Bestelmeyer, G., & Hess, D. (2010). Stock price responses to unemployment news: State dependence and the effect of cyclicality.*Unpublished working paper. University of Cologne, Germany*.
- Birz, G., & Lott Jr, J. R. (2011). The effect of macroeconomic news on stock returns: New evidence from newspaper coverage. *Journal of Banking & Finance*, *35*(11), 2791-2800.
- Bajo, O., & Esteve, V. (1998). ¿Existe un Efecto Fisher en el largo plazo? Evidencia para la economía española. *Revista Española de Economía*, 15(2), 149-166.
- Bekaert, G., & Engstrom, E. (2010). Inflation and the stock market: Understanding de "Fed Model". *Journal of Monetary Economics*, 57(3), 278-294.
- Boudoukh, J., & Richardson, M. (1993). Stock returns and inflation: A long – horizon perspective. *American Economic Review*, 83(5), 1346-1355.
- Boyd, J. H., Hu, J. & Jagannathan, R. (2005). The stock market's reaction to unemployment news: Why bad news is usually good for stocks. *The Journal of Finance*, 60(2), 649-672.
- Brown, J. S., & Warner, J. B. (1985). Using Daily Stock Returns: The Case of Event Studies. *Journal of Financial Economics*, 14(1), 3-31.
- Campbell, J., & Vuolteenaho, T. (2004). Inflation illusion and stock prices. *American Economic Review*, 94(2), 19-23.

- Cenesizoglu, T. (2011). Size, book-to-market ratio and macroeconomic news. Journal of Empirical Finance, 18, 248-270.
- Culter, D. M., Poterba, J. M., & Summers, L. H. (1989). What moves stock prices*? Journal of Portfolio Management*, 15, 4-12.
- Díaz, A., & Jareño, F. (2009). Explanatory factors of the inflation news impact on stock returns by sector: The Spanish case. *Research in International Business and Finance*, 23(3), 349-368.
- Díaz, A., & Jareño, F. (2013). Inflation news and stock returns: market direction and flow – through ability. *Empirical Economics*, 44(22), 775-798.
- Douglas, P. & Vance, R. (1988). Firm characteristics, unanticipated inflation, and stock returns. *The Journal of Finance*, 43(4), 965-981
- Estep, T. & Hanson, N. (1980). The valuation of financial assets in inflation. *Salomon Brothers*, New York.
- Evans, K. P. (2011). Intraday jumps and US macroeconomic news announcements. *Journal of Banking & Finance*, *35*(10), 2511-2527.
- Fama, F. (1981). Stock return, real activity, inflation, and money. *The American Economic Review*, 71(4), 545-565.
- Fama, F. (1988). Market efficiency, long – term returns, and behavioral finance. *Journal of Financial Economics*, 49, 283-306.
- Fama, F. & Schwert, G. (1977). Assets returns and inflation. *Journal of Financial Economics*, 5, 115-146.
- Ferrer, R. (2000). Interrelaciones entre el mercado de acciones y la tasa de inflación en el caso español. *Revista Española de Financiación y Contabilidad.* XXIX(104), 377-413.

  Flannery, M.J., & Protopapadakis, A. A. (2002). Macroeconomic Factors do influence aggregate stock returns. *The Review of Financial Studies*, 15(3), 751-782.
- Gallagher, L. & Taylor, M. (2002). The stock return - inflation puzzle revisited. *Economics Letters*, 75, 147-156.
- Geske, R. & Roll, R. (1983). The fiscal and monetary linkage between stock return and inflation. *The Journal of Finance*, 38, 1-33.
- Gilbert, T. (2011). Information aggregation around macroeconomic announcements: Revisions matter. *Journal of Financial Economics*, *101*(1), 114-131.
- Hardouvelis, G. (1988). Economic news, exchange rates and interest rates. *Journal of International Money and Finance*, 7, 23-35.
- Jaffe, J. F., & Mandelker, G. (1976). The 'Fisher Effect' for risky assets: an empirical investigation. *The Journal of Finance*, 31(2), 447-458.
- Jareño, F. (2005). Flow-through capability, the Spanish case**.** *Journal of Asset Management*, 6(3), 191-205.
- Jareño, F. (2006). Sensibilidad de los rendimientos sectoriales a tipos de interés reales e inflación. *Investigaciones Económicas*, XXX (3), 577-610.

- Jareño, F. (2006). Modelos de estudio del riesgo de interés e inflación. *Estrategia Financiera*, 232, 36-44.
- Jareño, F. (2007). Cambio de metodología en la elaboración del IPC y su impacto sobre la respuesta sectorial ante anuncios de inflación. *Información Comercial Española, Revista de Economía*, 836, 127-140.
- Jareño, F. (2008). "Spanish stock market sensitivity to real interest and inflation rates. An extension of the stone two-factor model with factors of the Fama and French Three-Factor model". *Applied Economics*, 40(24), 3159-3171.
- Jareño, F. (2009). El impacto de la publicación del IPC sobre el mercado bursátil español. *Información Comercial Española, Revista de Economía*, 851, 109-120.
- Jareño, F. & Navarro, E. (2010). Stock interest rate risk and inflation shocks. *European Journal of Operational Research*, 201, 337-248.
- Jareño, F. & Tolentino, M. (2012a). "Inflation risk management in Spanish companies". *Archives Des Sciences Journal*, 65(11), 10-18.
- Jareño, F. & Tolentino, M. (2012b). The Fisher effect in the Spanish case: a preliminary study. *Asian Economic and Financial Review*, 2(7), 841-857.
- Joyce, M. A. & Read, V. (1999). Asset price reactions to RPI announcements. *Applied Financial Economics*, 12(4), 253-270.
- Kaul, G. (1987). Stock returns and inflation: The role of the monetary sector. *Journal of Financial Economics*, 18, 253-276.
- Kritzman, M. P. (1994). What practitioners need to know about event studies? *Financial Analysts Journal*, 60(6), 17-20.
- Li, L., Narayan, P. K., & Zheng, X. (2010). An analysis of inflation and stock returns for the UK. *Journal of international financial markets, institutions and money*, 20(5), 519-532.
- Lintner, J. (1975). Inflation and security returns. *The Journal of Finance*, 30(2), 259-280.
- MaCkinlay, A. C. (1997). Event studies in economics and finances. *Journal of Economic Literature*, 35(1), 13-39.
- Miao, H., Ramchander, S., & Zumwalt, J. K. (2013). S&P 500 index-futures price jumps and macroeconomic news. *Journal of Futures Markets*, 00(0), 1-22.
- McQueen, G., & ROLEY, V. V. (1993). Stock prices, news, and business conditions. *The Review of Financial Studies*, 6(3), 683-707.
- Nikkinen, J., Omran, M., Salshtröm, P., & Äijö, J. (2006). Global stock market reactions to scheduled U.S macroeconomic news announcements. *Global Finance Journal*, 17(1), 92-104.
- Oxman, J. (2012). Price inflation and stock return. *Economics Letters*, 116(3), 385-388.
- De Gracia, F. P., & Cuñado, J. (1999). ¿Cubre el Mercado Bursátil Español frente a la inflación? Evidencia empírica para el periodo 1941 – 1999. *Estudios sobre la Economía Española, FEDEA*, Documento de trabajo, 65.
- Pearce, P. K., & Roley, V. V. (1985). Stock Prices and Economic News. *Journal of Business*, 58, 49-67.

- Peterson, P. P. (1989). Event Studies: A Review of Issues and Methodology. *Quarterly Journal of Business and Economics*, 28(3), 36-66.
- SHARPE, S. A. (2002). Reexamining stock valuation and inflation: The implication of analysts' earnings forecasts. *Review of Economics and Statistics*, 84(4), 632-648.
- Schwert, G. W. (1981). The adjustment of stock prices to information about inflation. *The Journal of Finance*, 36(1), 15-29.
- Solnik, B. (1983). The Relation between stock prices and inflationary expectations: The international evidence. *The Journal of Finance*, 38(1), 35-48.
- Stulz, R. M. (1986). Asset pricing and expected inflation. *The Journal of Finance*, 41(1), 209-223.
- Veronesi, P. (1999). Stock market overreaction to bad news in good times: a rational expectations equilibrium model. *The review of Financial Studies*, 12(5), 975-1007.