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The Asymmetric Effect of Monetary Policy on European Financial Markets

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ABSTRACT

This paper analyses the impact of unanticipated changes in domestic and foreign monetary policy on aggregate stock market performance and risk in five countries: France, Germany, Italy, Spain and the UK, using an event study methodology. We also study whether the common monetary policy has the same impact in selected EU member states. We relate the effect of domestic and foreign monetary policy surprises on financial markets to the prevailing phase of the economic cycle and the state of market sentiment. Our results suggest that during recessions and periods with low sentiment, unanticipated foreign monetary policy contraction is associated with negative stock market returns and increased financial market risk. We find that although there is asymmetry within the monetary policy transmission to financial markets within the EU, domestic monetary policy surprises have little effect on stock returns and stock market risk, particularly during phases of economic expansion and rising sentiment.

Keywords: Macro policy transmission; financial markets; economic integration

JEL Classification: F36; F42; G15

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Non-technical summary

Integrating financial markets is an important policy objective for the European Central Bank (ECB). This goal is promoted because it facilitates the smooth and balanced transmission of single monetary policy and makes it more effective, but a number of challenges can hinder this process. In this paper we focus on two of these, looking at the sensitivity of financial markets to foreign monetary policy, and the asymmetry of monetary policy transmission within the euro area countries.

The aims of this paper are threefold. First, we study the impact of unanticipated changes to domestic and foreign monetary policy on the aggregate stock market performance and risk of five countries: France, Germany, Italy, Spain and the UK. Second, we analyse whether the common monetary policy has the same impact in the selected EU member states. Finally, we consider whether the reaction of stock markets to unanticipated monetary policy changes is affected by the state of the economy and market sentiment.

We address a clear gap in the literature about the asymmetric transmission of shocks from the policies of the ECB and the BoE to asset markets and economic sentiment within the European Union. There is a great deal of literature on the relationship between monetary policy and financial markets, but most of the papers consider the euro area as a single entity and the dynamics within this economically diverse currency union are largely ignored.

Daily data on the index prices of national stock markets denominated in euros (CAC 40, DAX 30, FTSE MIB, IBEX 35 and FTSE 100) were obtained from Thomson Reuters Datastream. Annualised realised volatility at daily frequency is used to measure the stock market risk, and is provided by the Oxford-Man Institute of Quantitative Finance Realized Library. To classify whether the economy is in a phase of expansion or recession we use country-specific recession indicators provided by the Federal Reserve Bank of St. Louis (FRED). The Economic Sentiment Index series for the five countries in our dataset is obtained from Thomson Reuters Datastream. And finally, our proxy for the unanticipated change in the euro area policy rate is the one-day change in the three-month Euribor futures rate, while the change in the three-month Libor futures rate is used for the unanticipated change in the Bank of England policy rate. The sample period under investigation is from January 1999 to December 2018. The event study methodology was applied to address the research questions and the stock market reaction is studied on the day of the relevant Monetary Policy Committee meeting.

Our results suggest that an unanticipated contraction in foreign monetary policy is associated with negative stock market returns and higher financial market risk during both periods of recession and times when sentiment is low. We find that although there is asymmetry within the transmission of monetary policy to financial markets within the EU, domestic monetary policy surprises have little effect on stock returns and stock market risk, particularly when the economy is expanding and sentiment increasing.

Contents

1. Introduction

The depth and breadth of the global financial crisis in Europe highlighted the importance of an efficient and integrated financial system. Creating a true single market has become a priority for the European Central Bank (ECB), and the ultimate goal is to achieve more efficient credit allocation, enhance risk-sharing and encourage diversity in sources of financing, and, most importantly, to foster the smooth and effective transmission of monetary policy[1]. However, a number of challenges may hinder this process. In this paper we aim to focus on two of these challenges, the sensitivity of financial markets to monetary policy in foreign countries, and asymmetric monetary policy transmission within the euro area countries.

Policy actions taken by the European Central Bank (ECB) and the Bank of England (BoE) during the global financial crisis were specifically designed to restore stability to financial markets. The importance of the stock market as a channel for monetary policy transmission has been widely recognised in the literature on finance (see for example Chami, Cosimano and Fullenkamp (1999), for a comprehensive analysis of the stock market as a channel for monetary policy transmission). Differences in the transmission mechanisms in Europe imply, however, that uniform policy impulses from the ECB may cause asymmetric market responses across the monetary union. These asymmetries result in adjustment problems and may create tensions in the decision-making process of the ECB. Equally though, it is crucial as global markets become increasingly integrated that policymakers consider the potential spillovers from foreign policy-makers such as the BoE to the domestic economy.

This paper studies the national and international asymmetric effect of monetary policy surprises on the financial markets in five European countries, looking at France, Germany, Italy, Spain, and the UK. We analyse whether common monetary policy has the same impact in selected EU member states and whether the monetary policy shocks from the ECB and the BoE are transmitted across borders. We address a clear gap in the literature on asymmetric shock transmission from the policies of the ECB and the BoE to asset markets and economic sentiment within the European Union. There is a voluminous literature on the relationship between monetary policy and financial markets, but most of those papers consider the euro area as a single entity and the dynamics within this economically diverse currency union are largely ignored. To give a comprehensive overview of how financial markets react to unanticipated domestic and foreign monetary policy changes we consider the two perspectives of overall market performance measured by stock market returns and financial market risk measured by realised volatility. We also address the question of whether the reaction of stock markets to unanticipated monetary policy changes is affected by the state of the economy and market sentiment. Our results suggest that during periods of recession and of waning sentiment, unanticipated foreign monetary policy contraction is associated with negative stock market returns and higher risk in financial markets. We find that although there is asymmetry within the monetary policy transmission to financial markets within the EU, domestic monetary policy surprises have little effect on stock returns and stock market risk, particularly in phases of economic expansion and increasing sentiment.

[1]Consider, for example, the following statement made by Yves Mersch, Member of the Executive Board of the ECB, at the Government Borrowers Forum: "...Financial integration is essential for an effective monetary union and relevant to financial stability, to which we contribute. The Eurosystem's task of promoting well-functioning payment systems, as part of its monetary policy mandate, is also supported by financial integration. And it is not something we can take for granted: incomplete financial integration creates vulnerabilities..."

The outline of the rest of the paper is as follows. Section 2 presents the related literature, Section 3 describes our methodology, Section 4 presents the empirical results and Section 5 concludes.

2. Related Literature

This paper is related to three strands of the literature, covering the relationship between monetary policy surprises and stock markets, asymmetric shock transmission from domestic macroeconomic policies to foreign financial markets, and the link between market sentiment and asset prices.

2.1. The Theoretical Relationship between Macro Policy Surprises and Stock Markets

Financial economists have long recognised the strong relationship between macroeconomic news and stock market developments. Up until the 2007 financial crisis there was a consensus in the literature on the topic that an unexpected rise in the policy rate is associated with a fall in the domestic stock market indexes and an increase in stock market volatility. A significant number of past studies have focused on the relationship between unexpected changes in the monetary policy rate and stock market performance in the US. Bernanke and Kuttner (2005) find that an unanticipated increase in the US federal funds rate target has a negative effect on US stock returns. Similar results have been found for the US by Erhmann and Fratzscher (2004), Rigobon and Sack (2004) and Gürkaynak, Sack and Swanson (2005). Departing from this work Bomfim (2003), Brenner, Pasquariello and Subrahmanyam (2009), and Chuliá, Martens and van Dijk (2010) study how unanticipated monetary policy impacts the volatility of stock returns. While the literature on US monetary policy is extensive, the papers on the channels through which the monetary policy of the European Central Bank (ECB) spills over to the financial markets and its effects are limited in scope and numbers. Bredin et al. (2009), Hanousek, Kocenda and Kutan (2009), and Altavilla et. al. (2019) are among those who provide useful insights into the link between monetary policy and stock market developments in Europe. Chen (2007) studies the US data and finds that monetary policy has larger effects on stock returns in bear markets than in bull markets. This result is further confirmed in Jansen and Tsai (2010) and Kurov (2010), who also analyse US data. Christiano et al. (2010) analyse the role of monetary policy in excessive stock market booms. The authors argue that monetary policy has an important role to play in stabilising financial markets by moderating volatility through the credit growth channel. By studying excessive booms the authors essentially put the behavioural aspect of asset prices at the core of the discussion about financial market stability.

2.2. Monetary Policy and Market Sentiment

The traditional view, focusing on the ability of speculative markets to price financial assets on the basis of economic fundamentals, has been increasingly challenged by an approach that gives heavier weight to the impact of psychology and self-fulfilling expectations on asset prices (Bernanke (2015)). Baker and Wurgler (2006, 2007), Brown and Cliff (2005), and Kumar and Lee (2006) show that market sentiment predicts stock

returns both in the aggregate and in cross-section. The authors find a significant link between market sentiment and stock prices and conclude that investor sentiment has a significant impact on expected returns. Following this, Kurov (2010) studies whether the effect of monetary surprises on financial markets is driven by the influence of Fed policy on market sentiment. His results show that investor sentiment plays a significant role in how monetary policy affects the stock market. Guo, Hung and Kontonikas (2019) study US data and show that the state of investor sentiment strongly affects the transmission of monetary policy to the stock market, and that the effect is most potent when sentiment is waning. They argue that expansionary monetary policy surprises during periods when sentiment is waning boost the stock market by increasing market confidence and consequently making investors more willing to bear risk. This results in higher asset returns.

2.3. Cross-border Spillovers from Monetary Policy

The literature on monetary policy spillovers contains many studies investigating how monetary policy announcements from the US Federal Reserve affect asset markets in developing and developed economies (Kim (2001), Canova (2005), Mackowiak (2007), Georgiadis (2016), Chen et al. (2016), Ehrmann and Fratzscher (2009), and Hanousek, Kocenda and Kutan (2009)). The literature identifies large financial spillovers from conventional and non-conventional US monetary policy to global financial markets, including euro area financial markets. However, the spillovers from ECB monetary policy to US financial markets are found to be much smaller. This asymmetry in the international impact of US monetary policy and euro area monetary policy stems from the leading role that the US dollar plays in global financial markets. The literature on ECB monetary policy transmission within Europe is very limited. Bredin et al. (2009) study the equity market response to international monetary policy changes in the UK and Germany. Their results suggest that monetary policy surprises in the UK have a significant negative influence on stock market returns in both countries. The impact of euro area monetary policy shocks appears insignificant for both Germany and the UK. Lyócsa, Molnár and Plíhal (2019) study how monetary policy announcements affect the volatility of stock markets in the G7, meaning they include European countries in the sample. The authors find that volatility increases on the day of an interest rate announcement by the domestic central bank. They also find that it declines five days after an interest rate announcement across all the countries in the sample.

3. Methodology and Key Variables

3.1. Estimation of Monetary Surprises

We follow a widely used methodology to measure monetary policy surprises. In the US, the policy rate target is the Federal Funds rate, which is an interbank market rate for trading excess reserves between commercial banks, with the target rate set after each Federal Open Market Committee (FOMC) meeting. There is also a futures market interest rate based on the average monthly federal funds rate, which is called the federal funds futures rate. Differences between its value and the federal funds rate have been found to reflect expectations of a change in the interest rate. Bernanke and Kuttner (2005) use a scaled version of the one-day change in the federal funds future rate for the current month as a proxy for the unanticipated component (Δr_t^u) on the

day of the policy rate change:

$$\Delta r_t^u = \frac{D}{D-d}(f_t - f_{t-1}), \tag{1}$$

where f_t is the current-month futures rate on day t, d is the day of the monetary policy event, and D is the number of days in a month. The settlement price for contracts is based on the monthly average federal funds rate and so the change in the implied futures rate must be scaled up by a factor for the number of days in the month that is affected by the change.

There are no futures market instruments for either the euro area or the UK that are equivalent to those in the US and that track the policy rate in the UK or the euro area. However, there are interest rate futures contracts that can act as close substitutes, since they are likely to be strongly influenced by current expectations of future policy rates. Our proxy for the unanticipated change in the euro area policy rate is the one-day change in the three-month Euribor futures rate, and the change in the three-month Libor futures rate for unanticipated policy rate changes by the Bank of England, and scaling is not needed for these types of contract.

The sample period under investigation is January 1999 – December 2018, giving us 237 MPC meetings at the Bank of England and 260 at the ECB.

3.2. Stock Market Returns

Our dataset of stock returns covers four countries in the euro area, with two core countries in France and Germany and two periphery countries in Italy and Spain, together with the UK as a reference country. Daily data on national stock market index prices denominated in euros for the CAC 40, DAX 30, FTSE MIB, IBEX 35 and FTSE 100 were obtained from Thomson Reuters Datastream. We measure the stock returns for country i on day t when the Monetary Policy Committee (MPC) meets, $R_{i,t}$, as the first difference of the natural log of the daily closing stock price ($S_{i,t}$): $R_{i,t} = \ln S_{i,t} - \ln S_{i,t-1}$. All the prices obtained are denominated in euros.

3.3. Estimation of Stock Market Volatility

Annualised realised volatility at a daily frequency is used to measure stock market volatility. These high-frequency data have been kindly provided by the Realized Library of the Oxford-Man Institute of Quantitative Finance [2]. Employing realised volatility allows us to examine how monetary policy surprises drive the variation in the realised price of stock markets, meaning we avoid the issues that arise in studies encompassing expectations [3]. It has been shown in the previous literature that the simple measure of intraday realised volatility can be biased when there is microstructure noise (Hansen and Lunde (2006)). Patton and Sheppard (2009) show that different measures encompass different information, and they advocate using a combination of realised measures. Given these considerations, our measure of realised volatility is a simple arithmetic average of the following four realised measures of volatility:

[2] https://realized.oxford-man.ox.ac.uk/data

[3] See for example the discussion in Lyócsa, Molnár and Plíhal (2019) on measuring volatility using realised rather than implied measures

- 5-min realised volatility,
- 10-min realised volatility,
- 5-min realised kernel,
- 5-min realised volatility with 1-min sub-sampling.

We denote the annualised combination of realised measures as RV_t and subsequently refer to it as realised volatility.

3.4. States of Economy

To classify the economy into phases of expansion or recession we use country-specific recession indicators from the Federal Reserve Bank of St. Louis (FRED). This is FRED's interpretation of Composite Leading Indicators: Reference Turning Points and Component Series data provided by the Organisation for Economic Co-operation and Development (OECD). The OECD identifies the months of turning points without designating the date within the month on which the turning points occurred. FRED's series is composed of dummy variables that represent periods of expansion and recession. A value of 1 is a recession phase, while a value of 0 is an expansion phase. For this time series, the recession begins on the first day of the period following a peak and ends on the last day of the trough.

3.5. Market Sentiment States

The Economic Sentiment Index series for the five countries in our dataset comes from Thomson Reuters Datastream. The data are at monthly frequency. The question we address in this part is whether the impact of both domestic and foreign monetary policy surprises on financial markets depends on the state of market sentiment.

Baker and Wurgler (2006, 2007) provide detail on the challenges of measuring market sentiment. They argue that it is important to distinguish between business cycles and different states of market sentiment. The Economic Sentiment Index will inevitably reflect optimism and pessimism because of variation in the economic cycle. To remove such influences, at least partially, we regress the market sentiment proxy on the recession indicator from FRED and use the residuals from these regressions as our proxies of sentiment.

To distinguish further between the business cycle phase and the sentiment state, we focus on capturing the phases of waning sentiment. We capture this stage by constructing a dummy variable, $SENT^d$, that is equal to 1 if the policy meeting takes place while the sentiment index is decreasing. This distinction between the business cycle and sentiment states is marked reasonably effectively, as the average correlation between the recession dummy and the waning sentiment dummy is 0.08 (highest for France at 0.3 and lowest for the UK at -0.09) for the ECB policy meeting dates and 0.03 (highest for France at 0.31 and lowest for the UK at -0.18) for the BoE policy meeting dates.

3.6. Measuring the International Transmission of Monetary Policy Surprises

As the first step in our analysis we investigate the asymmetric effect that unexpected monetary policy changes have on domestic and international stock markets when the

economy is in the two different states of recession and expansion. Following Kurov (2010), we estimate the following regression for unexpected monetary policy changes on domestic financial markets:

$$R_{i,t} = \alpha_0 + \alpha_2 \Delta r^u_{i,t}(1 - REC_{i,t}) + \alpha_1 \Delta r^u_{i,t} REC_{i,t} + \varepsilon_{i,t}, \tag{2}$$

where $R_{i,t}$ is the log return of the stock index of interest between t and $t-1$ and the subscript i refers to the domestic market; $\Delta r^u_{i,t}$ is the surprise change in the domestic policy rate, defined as $\Delta r^u_{i,t} = f_t - f_{t-1}$, where f_t is the futures rate on day t and $REC_{i,t}$ is the dummy variable associated with a recession in the domestic market. The coefficient α_1 measures the average stock market response to unexpected monetary policy changes when the economy is in expansion and α_2 measures the response in a recession.

The regression used in Kurov (2010) has been amended to capture the cross-border effect of the unexpected monetary policy changes:

$$R_{i,t} = \alpha_0 + \alpha_2 \Delta r^u_{j,t}(1 - REC_{i,t}) + \alpha_1 \Delta r^u_{j,t} REC_{i,t} + \varepsilon_{i,t}, \tag{3}$$

where all the variables are the same as in (3), but the effect of the unexpected cross-border monetary policy changes is considered instead, as denoted by the subscript j in the equation.

Next we analyse the effect of monetary policy changes on domestic and international stock markets when market sentiment is rising and falling. We start by estimating the following regression outlined in Guo, Hung and Kontonikas (2019):

$$R_{i,t} = \alpha_0 + \alpha_1 \Delta r^u_{i,t}(1 - SENT^d_{i,t}) + \alpha_2 \Delta r^u_{i,t} SENT^d_{i,t} + \varepsilon_{i,t}, \tag{4}$$

where $SENT^d_{i,t}$ is the dummy variable associated with decreasing market sentiment. Next we estimate an equivalent regression to that in (5), but capture the cross-border effect of the unexpected monetary policy changes:

$$R_{i,t} = \alpha_0 + \alpha_1 \Delta r^u_{j,t}(1 - SENT^d_{i,t}) + \alpha_2 \Delta r^u_{j,t} SENT^d_{i,t} + \varepsilon_{i,t}. \tag{5}$$

Then we analyse the asymmetric effect of monetary policy changes on domestic and international stock market volatility with the economy in two different states. For the domestic effect we estimate the following regression:

$$RV_{i,t} = \alpha_0 + \alpha_1 \Delta r^u_{i,t} REC_{i,t} + \alpha_2 \Delta r^u_{i,t}(1 - REC_{i,t}) + \varepsilon_{i,t}, \tag{6}$$

where $RV_{i,t}$ is the annualised realised volatility of the i^{th} stock market index on day t.

For the cross-border effect we estimate the regression:

$$RV_{i,t} = \alpha_0 + \alpha_1 \Delta r^u_{j,t} REC_{i,t} + \alpha_2 \Delta r^u_{j,t}(1 - REC_{i,t}) + \varepsilon_{i,t}. \quad (7)$$

4. Empirical Results

4.1. The Effect of Monetary Policy Surprises on Stock Returns

4.1.1. The Effect of Monetary Policy Surprises on Stock Returns with the Economy in Different States

The first step in our analysis is to examine how the monetary policy surprises of the ECB and the BoE affect domestic and cross-border stock returns. Table 2 reports the OLS regression results for Equation 3. Panel a) reports how the ECB monetary policy surprises affect the returns on the domestic stock markets of France, Germany, Italy and Spain and the foreign one in the UK when the economy is expanding and in recession. Panel b) reports the same for the BoE monetary policy surprises.

Domestic effects: the coefficient estimates of the stock responses during expansions range from -0.053 to -0.002 and none of the coefficients are statistically different from zero (Table 2a). The coefficient estimates of the stock responses in recessions range from -0.17 to -0.068, and the coefficients in Germany and Italy are statistically significant at 1% and 5% respectively. The coefficient for the UK is a statistically significant -0.088 (Table 2b). This means the stock return series in our sample has a limited reaction to domestic monetary policy surprises, and the reaction is observed only in times of recession. These findings also show that there is a notable asymmetry in the transmission of the domestic monetary policy surprises to the European stock markets in our sample, as the estimated coefficients for the stock responses vary considerably for the countries in the sample.

Cross-border effects: Table 2b) reports much stronger results for the cross-border effects of monetary policy surprises. The coefficient estimates for the stock responses to foreign monetary policy surprises in expansions range from 0.060 to 0.114, and from -0.105 to -0.079 in recessions. All the coefficients are statistically significant. As with the domestic effects, we observe asymmetries in the transmission of the domestic monetary policy surprises to the European stock markets in our sample. The coefficient of the monetary policy surprise in a recession for France for example is a statistically significant -0.105. This implies that a hypothetical unanticipated 100-basis point cut in the BoE policy rate leads the return on the French stock market to rise by 0.105%. The rise in Italy is 0.079%. The stock market in the UK does not seem to react to cross-border monetary policy surprises.

The negative relationship between the unexpected foreign monetary policy changes and the local stock market has been documented in the previous literature. Numerous authors argue that globalisation has had important implications both for the transmission of shocks and for the conduct of monetary policy (Lane (2019), Rey (2018) and Ehrmann and Fratzscher (2009)). Ehrmann and Fratzscher (2009) for example study the cross-border spillovers of US monetary policy. They find that there is a strong relationship between the openness of countries, the degree to which their business cycle is correlated with that of the US, and the strength of the transmission of US monetary policy shocks. They also document a negative relationship between US monetary policy shocks and the financial market returns of many countries. Given the high degree of integration between the euro area and the UK during the sample pe-

riod, the findings for the periods of recession are consequently in line with the previous literature.

The finding of a positive relationship between the cross-border contractionary monetary policy and the returns in the euro area financial markets during expansionary phases in the economy differentiates our results from those in the earlier literature. The precise economic mechanism behind this empirical evidence is difficult to pin down, as the dynamics behind the international transmission of monetary policy are complex. From a theoretical perspective, there are three channels of transmission for monetary policy spillovers, which are (i) the aggregate demand channel; (ii) the financial channel; and (iii) the exchange-rate competitiveness channel (Chami, Cosimano and Fullenkamp (1999)). One channel may dominate at any given time or the markets may experience interaction between all three channels. It is worth keeping in mind that we apply the event study methodology in the current study, which means that we look at the short-term reaction of the markets from their expectations. We can attribute these findings to the exchange-rate competitiveness channel, as a tightening of foreign monetary policy generally causes the foreign exchange rate to appreciate and in the short term the local financial markets react positively to the newly improved competitiveness of the local markets. However, we do not claim to have a satisfactory macroeconomic and financial theory to explain these findings.

4.1.2. The Effect of Monetary Policy Surprises on Stock Returns with Market Sentiment in Different States

Next we examine how the monetary policy surprises of the ECB and the BoE affect domestic and cross-border stock returns and whether this effect is dependent on the state of market sentiment. Table 3 reports the OLS regression results for Equation 5. Panel a) reports the effect of ECB monetary policy surprises on the returns in the French, German, Italian and Spanish domestic stock markets and the foreign market in the UK when market sentiment is rising and falling. Panel b) reports the same for the BoE monetary policy surprises.

Domestic effects: the coefficient estimates of the stock responses when sentiment is rising range from -0.044 to 0.011 and none are statistically different from zero (Table 3a)). The coefficient estimates of the stock responses when sentiment is waning range from -0.048 to -0.016 and the coefficient in Germany is statistically significant at 1%. The coefficient for the UK is a statistically significant -0.044 at the 10% significance level when sentiment is rising (Table 3b)). This means we observe a very limited reaction of the stock returns in our sample to domestic monetary policy surprises, and only with waning sentiment. We can also see that the transmission of the domestic monetary policy surprises to the European stock markets in our sample is not uniform.

Cross-border effects: Table 3b) reports much stronger results for the cross-border effects of the monetary policy surprises. The coefficient estimates of the stock market responses to foreign monetary policy surprises when market sentiment is rising range from $-.136$ in Italy to 0.059 in France, and from -0.071 to -0.029 when sentiment is waning. In phases when sentiment is waning, the coefficients are statistically significant at 1% or better for France and Germany. As with the domestic effects, we observe asymmetries in the transmission of the domestic monetary policy surprises to the European stock markets in our sample. The coefficient of the monetary surprise in the phase of waning sentiment for Germany for example is a statistically significant -0.045. This implies that a hypothetical unanticipated cut of 100-basis points in the BoE policy rate leads to a rise of 0.045% in the German stock market return. The rise

in France is 0.065%.

4.2. The Effect of Monetary Policy Surprises on Stock Market Volatility

As the next step in our analysis we consider how unexpected changes in the monetary policy rate affect financial market risk. Table 4 reports the regression results for Equation 7. Panel a) reports the effect of ECB monetary policy surprises on volatility in the domestic stock markets in France, Germany, Italy and Spain and the foreign market in the UK during expansions and recessions.

Domestic effects: consistent with the findings for the stock returns, we find domestic monetary policy surprises have no impact on volatility in the French, German, Italian and Spanish stock markets during periods of expansion. The estimated coefficient for volatility in the UK stock market is also statistically insignificant. The results are consistent overall for the periods of recession, but are shown to be statistically significant at the 10% significance level for Germany and Spain. Also consistent with the findings for stock returns, the coefficient for volatility in the UK stock market is a statistically significant 0.486, which implies that a hypothetical unanticipated rise of 100 basis points in the BoE policy rate results in a rise of 0.486% in annual volatility (Table 4b)).

Cross-border effects: Table 4b) reports the influence of surprise changes in the UK policy rate on stock market volatility. It can be seen that stock market volatility in Spain reacts strongly to monetary policy surprises in the UK during periods of expansion. The estimated coefficient is 0.866, which is statistically significant at the 1% significance level. The impact on France and Germany of monetary policy surprises in the UK is similar, as it is statistically significant at the 1% significance level during periods of recession, with an estimated coefficient of 0.362 for France and of 0.310 for Germany.

The positive relationship between the monetary policy surprises and stock market volatility during periods of recession indicates that increases in the monetary policy rate are associated with increased stock market volatility on the day of the announcement. The sign of the estimated coefficient for Italy is different to that for the other countries in the sample. There is no theory that predicts the reaction of stock market volatility to foreign monetary policy. Empirically we can observe that the annualised realised volatility for Italy has been considerably lower than that for the other countries in the sample, and this might be reflected in the estimated coefficient.

In all three sections of our analysis we find that the reaction of the returns of euro area financial markets to domestic monetary policy surprises is limited. This can be attributed to the ECB starting to use forward guidance from 2013. In this, our empirical evidence supports the view that forward guidance helps the ECB to achieve the main objective of its monetary policy by keeping asset prices stable across the euro area around the dates of monetary policy announcements.

5. Summary and Conclusion

This paper uses an event study framework and looks at the asymmetric national and international effect of monetary policy surprises on the financial markets of five European countries, which are France, Germany, Italy, Spain, and the UK. We analyse whether the common monetary policy has the same impact in selected member countries of the euro area and whether the monetary policy shocks from the ECB and the

BoE are transmitted across borders. Two perspectives are considered, which are the overall market performance measured by stock market returns, and the financial market risk measured by realised volatility. We also address the question of whether the reaction of stock markets to unanticipated changes in monetary policy is affected by the state of the economy and by market sentiment. Overall we find that domestic monetary policy surprises have no impact on returns and risk in the French, German, Italian and Spanish stock markets during times of economic expansion and rising market sentiment. This suggests that with unexpected changes in domestic monetary policy, the market price already reflects the new information. These findings support the view in the recent literature that forward guidance is important for the overall strength of policy transmission (see, for example, Gertler and Karadi (2015)). Unanticipated foreign monetary policy changes, however, have a greater impact on financial markets. We observe a significant reaction from the financial markets to unexpected changes in foreign monetary policy, especially in periods of recession and when sentiment is waning. Our empirical analysis shows that during recessions and times of waning sentiment, unexpected tightening of foreign monetary policy is associated with negative stock market returns and higher financial market risk. We also show that unexpected domestic monetary policy changes are transmitted asymmetrically within the European financial market returns, but the transmission from foreign monetary policy surprises is almost symmetrical. The transmission of both domestic and foreign monetary policy to European stock market risk measured by volatility is more uniform.

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Table 1
Summary Statistics

a) European Central Bank Monetary Policy Meeting Dates

	Mean	Standard Deviation	Minimum	Maximum
ECB Monetary Policy Surprises	-0.002	0.053	-0.295	0.270
Stock Market Index Returns				
France	-0.053	1.670	-6.593	5.230
Germany	0.024	1.404	-6.007	5.757
Italy	-0.045	1.740	-6.024	4.655
Spain	0.012	1.681	-6.473	4.794
The UK	-0.034	1.302	-5.871	4.192
Annualised Realised Volatility				
France	0.325	0.697	0.027	9.513
Germany	0.370	0.567	0.016	5.418
Italy	0.138	0.302	0.000	2.407
Spain	0.333	0.446	0.020	3.816
The UK	0.236	0.519	0.014	6.920
Changes in Market Sentiment Index				
France	-0.207	2.038	-9.700	5.100
Germany	-0.082	1.783	-5.600	5.300
Italy	-0.114	2.571	-8.000	6.100
Spain	-0.064	1.742	-5.400	4.500
The UK	-0.088	2.901	-8.100	9.200
Number of Policy Meetings	237			

b) Bank of England Monetary Policy Meeting Dates

	Mean	Standard Deviation	Minimum	Maximum
BoE Monetary Policy Surprises	0.005	0.051	-0.190	0.440
Stock Market Index Returns				
France	-0.117	1.616	-6.593	9.221
Germany	-0.049	1.409	-6.007	6.747
Italy	-0.112	1.770	-6.024	10.684
Spain	-0.094	1.783	-6.473	13.484
The UK	-0.088	1.228	-5.871	5.032
Annualised Realised Volatility				
France	0.284	0.685	0.010	9.513
Germany	0.311	0.524	0.012	5.418
Italy	0.123	0.240	0.000	2.407
Spain	0.325	0.721	0.020	9.164
The UK	0.228	0.528	0.013	6.920
Changes in Market Sentiment Index				
France	-0.080	2.041	-9.700	5.100
Germany	0.004	1.708	-5.600	5.300
Italy	-0.040	2.473	-8.000	6.100
Spain	-0.040	1.722	-5.400	4.500
The UK	-0.034	2.935	-8.100	9.200
Number of Policy Meetings	225			

Notes: The sample period is from January 2000 through to December 2018. Panel a) shows summary statistics for the monetary policy surprises, returns on the stock market indexes, annualised stock market volatilities and changes in economic sentiment indexes for the dates of the ECB monetary policy meetings, and b) shows them for the BoE. Monthly data are used for the changes in the market sentiment index, all other data are at daily frequency.

Table 2

a) Response of Stock Returns to ECB Unexpected Monetary Policy Rate Changes in Different States of Economy

	France	Germany	Italy	Spain	The UK
Constant	-0.060	0.010	-0.045	0.010	-0.040
	(-0.550)	(0.110)	(-0.404)	(0.093)	(-0.476)
Economy Expansion	-0.053	-0.014	0.025	-0.002	-0.028
	(-1.514)	(-0.577)	(0.757)	(-0.054)	(-1.368)
Economy Contraction	-0.017	-0.068***	-0.055**	-0.031	-0.030
	(-0.653)	(-2.756)	(-1.967)	(-1.218)	(-1.155)
R^2	0.011	0.033	0.019	0.006	0.014
Number of Observations	237	237	237	237	237
N of Expansion Period Observations	*135*	*124*	*142*	*126*	*161*
N of Contraction Period Observations	*102*	*113*	*95*	*111*	*76*

b) Response of Stock Returns to BoE Unexpected Monetary Policy Rate Changes in Different States of Economy

	France	Germany	Italy	Spain	The UK
Constant	-0.132	-0.034	-0.129	-0.109	-0.063
	(-1.265)	(-0.376)	(-1.112)	(-0.939)	(-0.795)
Economy Expansion	0.064*	0.060*	0.082**	0.114***	0.010
	(1.797)	(1.885)	(2.076)	(2.792)	(0.417)
Economy Contraction	-0.105***	-0.081***	-0.079***	-0.085***	-0.088***
	(-4.267)	(-3.806)	(-2.867)	(-3.172)	(-4.354)
R^2	0.088	0.075	0.054	0.075	0.079
Number of Observations	225	225	225	225	225
N of Expansion Period Observations	128	117	144	124	149
N of Contraction Period Observations	97	108	81	101	76

Notes: The coefficients reported in columns 1-4 in Panel a) and in column 5 in Panel b) are for the following regression: $R_{i,t} = a_0 + a_1\Delta r^u_{i,t}(1 - REC_{i,t}) + a_2\Delta r^u_{i,t}(REC_{i,t}) + \varepsilon_{i,t}$ and in columns 1-4 in Panel b) and column 5 in Panel a): $R_{i,t} = a_0 + a_1\Delta r^u_{j,t}(1 - REC_{i,t}) + a_2\Delta r^u_{j,t}(REC_{i,t}) + \varepsilon_{i,t}$, where $REC_{i,t}$ is the dummy variable associated with a recession phase. T-statistics are shown in parentheses, ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels respectively.

Table 3

a) Response of the Economic Sentiment to the ECB Monetary Policy Rate Changes

	France	Germany	Italy	Spain	The UK
Constant	-0.059	0.019	-0.051	0.008	-0.046
	(-0.546)	(-0.213)	(-0.441)	(-0.077)	(-0.544)
Increasing Market Sentiment	-0.032	-0.022	-0.012	-0.026	-0.044*
	(-0.886)	(-0.674)	(-0.291)	(-0.929)	(-1.849)
Decreasing Market Sentiment	-0.028	-0.048***	-0.027	-0.016	-0.016
	(-1.107)	(-2.334)	(-1.034)	(-0.514)	(-0.732)
R2	0.010	0.025	0.006	0.005	0.017
Number of Observations	237	237	237	237	237
N of Increasing Sentiment Observations	*116*	*122*	*112*	*129*	*113*
N of Decreasing Sentiment Observations	*121*	*115*	*125*	*108*	*124*

b) Response of the Economic Sentiment to the BoE Monetary Policy Rate Changes

	France	Germany	Italy	Spain	The UK
Constant	-0.099	-0.038	-0.099	-0.067	-0.081
	(-0.930)	(-0.406)	(-0.840)	(-0.561)	(-0.995)
Increasing Market Sentiment	0.059	-0.036	-0.136	-0.104	0.056
	0.131	(-0.083)	(-0.232)	(-0.388)	(0.017)
Decreasing Market Sentiment	-0.065***	-0.045***	-0.029	-0.071	-0.062***
	(-2.786)	(-2.247)	(-1.136)	(-1.502)	(-3.452)
R2	0.039	0.023	0.010	0.013	0.056
Number of Observations	225	225	225	225	225
N of Increasing Sentiment Observations	*118*	*116*	*107*	*123*	*112*
N of Decreasing Sentiment Observations	*107*	*109*	*118*	*102*	*113*

Notes: The coefficients reported in columns 1-4 in Panel a) and in column 5 in Panel b) are for the following regression: $R_{i,t} = a_0 + a_1\Delta r^u_{i,t}\left(1 - SENT^d_{i,t}\right) + a_2\Delta r^u_{i,t}\left(SENT^d_{i,t}\right) + \varepsilon_{i,t}$ and in columns 1-4 in Panel b) and column 5 in Panel a): $R_{i,t} = a_0 + a_1\Delta r^u_{j,t}\left(1 - SENT^d_{i,t}\right) + a_2\Delta r^u_{j,t}\left(SENT^d_{i,t}\right) + \varepsilon_{i,t}$, where $SENT^d_{i,t}$ is a dummy capturing the sentiment-waning state. T-statistics are shown in parentheses, ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels respectively.

Table 4

a) Response of the Stock Market Volatility to the ECB Unexpected Monetary Policy Rate Changes

	France	Germany	Italy	Spain	The UK
Constant	0.326***	0.374***	0.327***	0.333***	0.240***
	(7.197)	(10.157)	(8.260)	(11.493)	(7.085)
Economy Expansion	0.007	-0.004	-0.014	-0.004	0.004
	(0.446)	(-0.381)	(-1.100)	(-0.394)	(0.479)
Economy Contraction	0.012	0.018*	0.028	0.012*	0.015
	(1.103)	(1.817)	(1.307)	(1.822)	(1.415)
R^2	0.006	0.015	0.029	0.015	0.009
Number of Observations	237	237	237	237	237
N of Expansion Period Observations	*135*	*124*	*142*	*126*	*161*
N of Contraction Period Observations	*102*	*113*	*95*	*111*	*76*

b) Response of the Stock Market Volatility to the BoE Unexpected Monetary Policy Rate Changes

	France	Germany	Italy	Spain	The UK
Constant	0.276***	0.300***	0.235***	0.296***	0.211***
	(6.110)	(8.811)	(8.583)	(6.506)	(6.384)
Economy Expansion	0.122	0.073	0.136	0.866***	0.091
	(0.795)	(0.609)	(1.134)	(5.401)	(0.910)
Economy Contraction	0.362***	0.310***	-0.478**	0.152	0.486***
	(3.415)	(3.902)	(-2.136)	(1.438)	(5.782)
R^2	0.052	0.066	0.050	0.123	0.134
Number of Observations	225	225	111	225	225
N of Expansion Period Observations	*123*	*112*	*78*	*114*	*149*
N of Contraction Period Observations	*102*	*113*	*33*	*111*	*76*

Notes: The coefficients reported in columns 1-4 in Panel a) and in column 5 in Panel b) are for the following regression: $RV_{i,t} = a_0 + a_1\Delta r^u_{i,t}\left(1 - REC_{i,t}\right) + a_2\Delta r^u_{i,t}\left(REC_{i,t}\right) + \varepsilon_{i,t}$ and in columns 1-4 in Panel b) and column 5 in Panel a): $RV_{i,t} = a_0 + a_1\Delta r^u_{j,t}\left(1 - REC_{i,t}\right) + a_2\Delta r^u_{j,t}\left(REC_{i,t}\right) + \varepsilon_{i,t}$, where $RV_{i,t}$ is the annualised realised volatility of i^{th} stock market index at day t. T- statistics are shown in parentheses, ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels respectively.

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