Shocking Markets: European Stock Markets and the ECB's Monetary Policy Surprises

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Motivation

- Measuring the consequences of unexpected monetary policy decisions on financial markets

- Of interest for central bankers (transmission process of interest rate setting) and financial market participants (portfolio decisions)

- Previous Evidence: Vast literature for the US perspective, little evidence for the European financial markets

- Our contribution to the literature:
  (a) Applying the question to the ECB's monetary policy and the euro area stock markets
  (b) Developing a methodology to extract monetary policy shocks
  (c) Implementing an approach which controls for endogeneity of the variables

Research Questions

- Is there a significant reaction of the stock markets following monetary policy shocks?
- How do the results fit in the existing international evidence?
- Does monetary impulses spread uniformly across major EMU stock markets?
- Does the ECB successfully communicates their monetary policy?

Methodology

- A simple OLS is not suitable because of endogeneity
- A basic model for interaction of monetary policy and stock prices

$$\Delta i_t = \beta \Delta s_t + \gamma z_t + \epsilon_t \tag{1}$$

$$\Delta s_t = \alpha \Delta i_t + z_t + \eta_t \tag{2}$$

with

Δi_t = change in interest rate

Δs_t = stock returns

z_t = vector of exogenous variables

ϵ_t = monetary policy shock

η_t = asset price shock

Methodology

Technique to handle endogeneity: Identification through heteroskedasticity approach (Rigobon and Sack (2004))

- Idea: α can be identified without bias on days when the volatility of the monetary policy shock (σ_ϵ) increases
- Procedure: Watch the change in co-movement of interest rates and asset prices on days of higher compared to average variance of the monetary policy shock (σ_ϵ)
- Define two subsamples
  - ◇ F : Days of higher σ_ϵ (ECB Governing Council meetings)
  - ◇ F^*: Days of average σ_ϵ (day preceding Council meetings)

Methodology

- Assumptions on variance of the shocks
  - ⋄ $\sigma_\epsilon^F > \sigma_\epsilon^{F^*}$: Heteroskedasticity in variance of monetary policy shock
  - ⋄ $\sigma_\eta^F = \sigma_\eta^{F^*}$, $\sigma_z^F = \sigma_z^{F^*}$: Homoskedasticity in variances of asset price and common shocks
- Identify α out of the co-movement of interest rates and asset prices
  1. Solve Eq. (1) and (2)
  2. Estimate covariance matrix for each subsample F^* and F
  3. Substract matrix F^* from matrix F under the above stated assumptions
  4. The estimator α can be identified as an element of the substracted covariance matrix

Data I

- Sample runs from January 1, 1999 to February 28, 2007
- Selected stock markets
  - ◇ The four largest national stock markets and their indices (German DAX 30, the French CAC 40, the Spanish $IBEX$ 35 and the Italian MIB 30)
  - ◇ The aggregate European stock market (i.e. $Euro\ Stoxx$ 50)
- Selected interest rate proxy
  - ◇ One month EURIBOR

Data II

Identifying monetary policy shocks

- Changes in expectation of market participants as proxy for monetary policy shocks

1. Derived through heavily traded futures and swaps (EONIA swaps and EURIBOR futures)
   - ◇ Shocks extracted by principal components analyses (PC)
   - ◇ Shock if rate exceeds mean of the series by twice its standard deviation
2. Derived through surveys of market economists (Reuters, Bloomberg, OBCE)
   - ◇ Shock if less than half of the respondents expected the move in advance
3. Derived through a combination of both PC and survey definitions (COM)

Empirical Results

Table 1: Shocks Extracted by Different Definitions

Date of Press Meeting	Shock Definition		
	PC	SURVEY	COM
08.04.1999	x		x
07.10.1999	x		x
03.02.2000		x	x
27.04.2000	x	x	x
08.06.2000	x		x
20.07.2000	x		x
05.10.2000	x	x	x
04.01.2001	x		x
29.03.2001		x	
11.04.2001		x	x
10.05.2001	x	x	x
30.08.2001		x	x
17.09.2001	x	x	x
11.10.2001	x	x	x
10.10.2002	x		x
07.11.2002	x		x
06.03.2003	x	x	x
08.05.2003		x	
01.12.2005		x	x
02.03.2006		x	
06.04.2006	x	x	x
05.10.2006		x	
07.12.2006		x	x
No. of shocks	14	16	19

Empirical Results

Table 2: Stock Returns after Monetary Policy Shocks, 1 January 1999 - 28 February 2007

Shock Definition	PC	SURVEY	COM
Point Estimator	$\hat{\alpha}_{PC}$	$\hat{\alpha}_{SUR}$	$\hat{\alpha}_{COM}$
Euro Stoxx 50	-8.40	-9.30	-7.66
	(-2.53)**	(-2.30)**	(-2.38)**
DAX 30	-7.78	-7.70	-7.01
	(-2.10)*	(-1.79)*	(-2.03)*
CAC 40	-6.98	-7.19	-6.33
	(-2.25)**	(-1.85)*	(-2.00)*
IBEX 35	-6.26	-6.48	-5.68
	(-2.02)*	(-1.77)*	(-1.91)*
MIB 30	-4.32	-3.61	-4.16
	(-1.31)	(-0.97)	(-1.38)

Notes: PC indicates shocks derived through the principal components analysis. $SURVEY$ states the shocks found from the survey results. COM denotes extracted shocks as combination of the survey and the principal components definition. t-values are in brackets. The one month EURIBOR is applied as proxy for the policy rate. *, ** denotes statistical significance at the 10 percent and 5 percent level, respectively.

Summary and conclusion

- Findings for Europe indicate a negative and significant response of European stock returns (1.56 to 2.32 percent) to shocks (unexpected 0.25 percent rise) induced by the ECB
- Results correspond with the evidence for the US (Rigobon and Sack (2004), Bernanke (2005))
- Homogenous reaction of national stock markets to unexpected monetary policy decisions
- Number of shocks suggests a high predictability of the ECB's monetary policy

Methodology: Supplements

- Solve the reduced form of Eq. (1) and (2) and estimate the covariance for both subsamples

$$\Omega_s = \frac{1}{(1-\alpha\beta)^2}\begin{bmatrix}\sigma_\epsilon^s + \beta^2\sigma_\eta^s + (\beta+\gamma)^2\sigma_z^s & \alpha\sigma_\epsilon^s + \beta\sigma_\eta^s + (\beta+\gamma)(1+\alpha\gamma)\sigma_z^s \\ \cdot & \alpha^2\sigma_\epsilon^s + \sigma_\eta^s + (1+\alpha\gamma)^2\sigma_z^s\end{bmatrix} \tag{3}$$

with $s = \{F, F^*\}$

- Assuming α, β and γ to be stable across the subsample, we can substract the covariance matrices

$$\Delta\Omega = \Omega^F - \Omega^{F^*} = \frac{\sigma_\epsilon^F - \sigma_\epsilon^{F^*}}{(1-\alpha\beta)^2}\begin{bmatrix}1 & \alpha \\ \alpha & \alpha^2\end{bmatrix} \tag{4}$$

and identifiy $\hat{\alpha}$ by

$$\hat{\alpha} = \frac{\Delta\hat{\Omega}_{1,2}}{\Delta\hat{\Omega}_{1,1}} \tag{5}$$