FOMC Communication, US Financial Markets, and Federal Funds Target Rate Changes

Bernd Hayo
(Philipps-University Marburg)
Ali Kutan
(Southern Illinois University)
Matthias Neuenkirch
(Philipps-University Marburg)

- Presentation based on two papers

- I. Communicating with Many Tongues: FOMC Speeches and U.S. Financial Market Reaction
  - Bernd Hayo (Philipps-University Marburg)
  - Ali Kutan (Southern Illinois University)
  - Matthias Neuenkirch (Philipps-University Marburg)

- II. Does FOMC Communication Help Predicting Federal Funds Target Rate Changes?
  - Bernd Hayo (Philipps-University Marburg)
  - Matthias Neuenkirch (Philipps-University Marburg)

1. Introduction

Motivation

- Most studies on central bank communication focus on: formalized aspects of monetary policy, including rate decisions, statements and minutes

- The more formal methods of communication appear rather infrequently:
  - FOMC meets eight times a year (usually)
  - monetary policy report comes out bi-annually

Introduction

- But: Speeches and testimonies are also part of communication strategy
- Speeches are delivered much more often
- Improvement of formal communications since the 1990s as well as an increased number of speeches

  → Possible source of new and more accurate information for economic agents, who adjust their behaviour accordingly

Introduction

Research questions

- Is there an effect of speeches on financial markets' returns/volatility?
- Is the impact bigger/smaller than the one of more formalized communication?
- Does the effect depend on the hierarchical position of the FOMC member?
- Do markets react differently to the written content of all delivered speeches and the filtered newswire reports?

Introduction

Related papers

- Blinder et al. (Working Paper, ECB, 2008)
  - Up-to-date survey
- Ehrmann and Fratzscher (JMCB, 2007)
  - Panel analysis of three central banks
  - News come from news wire reports
- Reinhart and Sack (mimeo, 2005)
  - Intraday data
- Kohn and Sack (Working Paper, Bank of Canada, 2004)
  - Case study approach
- Chirinko and Curran (mimeo, 2005)
  - Information leeks before actual communications come out

Outline

1. Introduction
2. Methodology
3. Effect of news on returns
4. Effect of news on volatility
5. Robustness tests
6. Central bank communication and its media representation
7. Conclusions and further research

2. Methodology

- Analysis of all Fed member speeches and congressional hearings from 1998 to 2006
- Inclusion of statements and monetary policy reports in the analysis for purposes of control and comparison
- Examination and classification of written content of speeches, to generate a new data set.
- Summaries of:
  - 1439 speeches,
  - 151 congressional hearings (testimonies),
  - 68 post-meeting statements and
  - 20 monetary policy reports from members of the BOG and the regional Fed presidents

Methodology

- Classification in dummies regarding

  - monetary policy inclination

  - economic outlook

- Splitting in positive and negative news dummies to control for a possible asymmetric reaction of financial markets
- Including lead and lag to account for information leaks and delayed responses
- Dependent variable: daily returns
- Estimation takes place within a general class of GARCH models
- Application of a general-to-specific modelling approach

Methodology

Example of a speech and our coding

- Remarks by Chairman Alan Greenspan "Economic Developments" before the Economic Club of New York, New York (May 24, 2001)

  […] Moreover, with inflation low and likely to be contained, the main threat to satisfactory economic performance appeared to come from *excessive weakness in activity*. So we took out the restraint inherent in our previous policy stance and have moved policy to a more accommodative posture to counter the effects of the downshift in demand. […] The period of sub-par economic growth is not yet over, and we are *not free of the risk that economic weakness will be greater than currently anticipated, requiring further policy response*. […]
- Coding:

  Speech / Alan Greenspan / Economic Outlook / Negative and

  Speech / Alan Greenspan / Monetary Policy / Easing

Methodology

- Number of non-zero values for the dummy variables

	MP Tightening	MP Easing	Positive EO	Negative EO
FOMC Statements	35	0	24	17
Monetary Policy Reports	6	1	15	5
FOMC Testimonies	4	2	17	3
BoG Speeches	31	6	92	31
Presidents' Speeches	88	3	249	60

- More comments regarding the EO than the MP stance.
- Positive economic outlook and hawkish comments occur far more often than their opposites.

Methodology

Some estimation problems

- Convergence problems of highly general models set constraints on the degree of generality
  - In particular: Inclusion of news dummies in variance equation causes breakdown of estimation algorithms because of multimodality
- Thus: The impact of news on volatility is studied in a simpler class of models
- If no evidence of ARCH is found (as on the foreign exchange market) an OLS model is estimated for efficiency reasons

Methodology

Modelling US financial markets' daily returns

- General model is an asymmetric threshold GARCH(1,1) in mean with t-distributed residuals (ATGARCHM-t(1,1) for bond and equity markets with 6 lags of control variables)

$$(1)\quad returns_t = \gamma + \sum_{r=1}^{6} \delta_r \cdot returns_{t-r} + \sum_{r=1}^{6} \zeta_r \cdot other\ \ markets'\ \ and\ \ European\ \ returns_{t-r}$$

$$+\eta \cdot FFTR\ \ movements + \theta \cdot consensus\ \ forecasts + \iota \cdot macroeconomic\ \ announcements$$

$$+\lambda \cdot 09/11/2001 + \sum_{r=-1}^{1} \nu_r \cdot communication\ \ dummies_{t-r} + o \cdot h_t + \mu_t,$$

$$\mu_t = \varepsilon_t h_t^{1/2},$$

$$h_t = \alpha_0 + \alpha_1(\mu_{t-1} - \kappa_1)^2 + \kappa_2 \tau (\mu_{t-1} - \kappa_1)^2 + \beta_1 h_{t-1},$$

$$\tau = 1\ \ if\ \ u_{t-1} < \kappa_1\ \ and\ \ zero\ \ otherwise.$$

Methodology

Controls:

- European financial market variables, as well as the U.S dollar/Yen spot rate to control for global turbulences on financial markets
- Actual movements in the Federal Funds target rate
- Market's expectations of output and inflation (Quarterly Consensus Forecasts of GDP and CPI)
- Announcements of twelve important macroeconomic indicators watched by market participants
- Dummy 11 September 2001

Methodology

- Simpler model for studying the effect of news on financial markets' volatility (volatility of returns)
- GARCH(1,1) model for all markets

$$(2)\quad returns_t = \gamma \cdot FFTR\ \ movements + \delta \cdot macroeconomic\ \ announcements$$

$$+ \zeta \cdot 09/11/2001 + \eta \cdot communication\ \ dummies + \mu_t,$$

$$\mu_t = \varepsilon_t h_t^{1/2},$$

$$h_t = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \beta_1 h_{t-1} + \theta \cdot macroeconomic\ \ announcements$$

$$+ \iota \cdot communication\ \ dummies.$$

3. Effect of news on returns

- Three sets of regressions

1. **Different types of communication:**

   Statements, monetary policy reports, testimonies, speeches

2. **Different hierarchical positions I:**

   Board of Governors vs. regional presidents

3. **Different hierarchical positions II:**

   Chairman, Vice Chairman, BoG members, voting presidents, non-voting presidents

Effect of news on returns

- Expected signs of communication dummies on returns

	Bond	Stock	FX
Strong Economic Outlook	+	+	-
Weak Economic Outlook	-	-	+
Tightening Inclination	+	-	-
Easing Inclination	-	+	+

- Exchange rate in price notation $/€

- General outcome of our study: Many variables have consistent but some variables have non-consistent signs

Effect of news on returns

Bond markets

- Statements exert the largest influence, followed by monetary policy reports/testimonies and finally by speeches
- Speeches given by Board of Governor members exert a larger effect than those by regional presidents
- Further disaggregation shows:
  - Chairman and Vice Chairman exert a larger influence than ordinary Board of Governors' members
  - Voting presidents exert a larger influence than non-voters

Effect of news on returns

- In all sets of regressions, we find evidence for an asymmetry of reaction depending on the contents:

  → negative news have an absolutely larger effect than positive news

- The bond market reaction is increasing with ascending maturity:

  → change in returns is more pronounced for the longer maturities

Effect of news on returns

Equity and Foreign Exchange Market

- No significant impact in the initial sets of regressions
- Only further disaggregation exhibits significant coefficients but with few expected signs

Effect of news on returns

- Estimated coefficients show that more formal methods of communication have a relatively larger impact on financial markets
- Taking into account the different frequency of occurrence of these different types of communications demonstrates that less formal ones are at least as importance for moving interest rates

	# of Events	3 Months	6 Months	1 Year	2 Years
Target Rate Hikes	24	-0.69	-0.21	-0.01	0.17
Chairman MP +	7	0.09	0.02	0.08	0.04
Vice Chairman MP +	4	0.26	0.29	0.19	0.13
BoG Members MP +	24	0.47	0.37	0.43	0.64
Voting Presidents MP +	32	0.97	0.70	0.60	0.52
Non-Voting Presidents MP +	56	0.85	0.59	0.76	0.52

4. Effect of news on volatility

- Focus on occurring communication events only

  → indicator does not differentiate between positive/negative or monetary policy/economic outlook

- Two types of news indicators for the volatility equation

  1. **Different forms of communication:**

     Statements, monetary policy reports, testimonies, Board of Governors' speeches, presidents' speeches

  2. **Different hierarchical positions:**

     Chairman, Vice Chairman, BoG members, voting presidents, non-voting presidents

Effect of news on volatility

- Negative impact of all significant dummies on volatility
- Thus, if central bankers communicate with the public, volatility in returns decreases

  → Central bankers could be seen “psychologists”

Bond markets

- No impact on one and two year bonds’ volatility
- Diminishing influence of news on volatility with maturity (note difference to returns equation!)
- Increasing impact with the degree of formality of form of communication (exception: Statements)
- Ascending influence with hierarchical position

Effect of news on volatility

Equity Market

- Ascending influence with degree of formality
- Vice Chairman exerts larger impact than Board of Governors' member or regional presidents

Foreign Exchange Market

- Ascending influence with the degree of formality
- Approximately same impact of all hierarchical groups in the FOMC

5. Robustness checks

- Splitting the sample
- Omission of economic outlook dummies to see whether collinearity with the monetary policy variables explains “wrong signs”
- Construction of novelty (did MP or EO change since last news item or within a 20 days window?) and repetition indices (counting the number of times a particular view is repeated in the news)
- Calculation of excess returns over the last 20 business days and testing influence of news
- Construction of capital outflow/inflow dummies and interaction with news indicators

Robustness checks

- Code all speeches by the Chairmen (Greenspan and Bernanke) in a separate dummy
- Extending our volatility analysis to differentiate between central bank communication around the time of FOMC meetings and during "normal" times confirms earlier result
- Estimate models including the Ehrmann and Fratzscher (2007)-dummies. Throughout almost all financial markets and maturities their speeches dummies reveal the right signs if significant
- Thus: None of our results appears to be particularly affected by these modifications

6. Central bank communication and its media representation

- Why do our speech dummies yield more unexpected coefficients for the Economic Outlook variables compared to Ehrmann and Fratzscher's (E&F 2007) study?
- To address this question, we employ the data set from and conduct experiments
- Making our data comparable:
  - shortening the observation period,
  - coding our variables in +1/0/-1 variables
  - concentrating on a one-day window only.

Central bank communication and its media representation

- Compare the outcome with E&F:

Using news variables from our approach only:

	3 Months	6 Months	1 Year	2 Years	S&P 500
BoG Members EO	-0.0077**				

Using news variables from Ehrmann and Fratzscher (2007) only:

	3 Months	6 Months	1 Year	2 Years	S&P 500
E&F Greenspan MP	0.0142**	0.0149**	0.0181*	0.0234**	-0.0063**
E&F Greenspan EO				0.0219*	0.0063**
E&F Presidents EO					0.0043*

Using both sets of news:

	3 Months	6 Months	1 Year	2 Years	S&P 500
BoG Members EO	-0.0073**				
E&F Greenspan MP	0.0149**	0.0144*	0.0174*	0.0237**	-0.0065**
E&F Greenspan EO			0.0131*	0.0297**	0.0059**
E&F Presidents EO					0.0044*

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only significant coefficients of the variables under examination are listed.

Central bank communication and its media representation

From the table we can infer that:

1. Our news: one significant variable (wrong sign)
2. E&F news: many significant variables (correct signs)
3. Combining both sets of news variables in one regression reveals that they appear to be almost orthogonal to each other

Central bank communication and its media representation

- Match our speech dummies relating to the original source with E&Fs newswire variables

Alan Greenspan

	MP	E&F MP	EO	E&F EO
Number of news occurrences	9	56	35	38
% matched on same day	44.4%		51.4%	
% matched on same and subsequent day	100.0%		65.7%	

BoG Members

	MP	E&F MP	EO	E&F EO
Number of news occurrences	12	10	52	15
% matched on same day	8.3%		9.6%	
% matched on same and subsequent day	16.7%		19.2%	

Presidents

	MP	E&F MP	EO	E&F EO
Number of news occurrences	23	20	154	12
% matched on same day	4.3%		1.3%	
% matched on same and subsequent day	21.7%		5.2%	

Central bank communication and its media representation

Economic Outlook:

- Speeches seem to be of particular interest to the media when they are delivered by Alan Greenspan, as the number of newswire reports and our indicators are roughly the same.
- Two thirds of our news events coincide with E&Fs indicators either on the same or the subsequent day.
- Only about 20 percent of our BoG speeches correspond with E&F, and statements about the economic outlook by regional presidents are almost completely ignored by the media.

Central bank communication and its media representation

Monetary Policy:

- We find a huge gap between the absolute number of Greenspan-related events covered by the media and those recorded in our data.
- The match between both variables is fairly large on the first day and perfect when including another day.
- News generated by BoG members and regional presidents show a deceptive similarity in absolute numbers. The actual matching between written speeches and media coverage is poor.

Central bank communication and its media representation

- How to explain that there is much more Greenspan news in the media than delivered in official speeches and congressional hearings?

  Newswire variables:

  - Include informal interviews as well as information from the question and answer sessions
  - Newswire reports may be not precise in stating who actually spoke on behalf of the Fed

- All of our monetary policy speeches by Greenspan coincide with E&F media news on the same or on the subsequent day.

Central bank communication and its media representation

- We explore this timing issue by adjusting the dates of all Greenspan speeches according to their appearances in newswire reports.

Using adjusted news variables from our approach only

	3 Months	6 Months	1 Year	2 Years	S&P 500
Greenspan MP	0.02958**	0.03672**	0.04585**	0.04927**	

Using both sets of news variables

	3 Months	6 Months	1 Year	2 Years	S&P 500
Greenspan MP			0.03025**		
E&F Greenspan MP	0.01267**	0.01184**		0.01970**	-0.00735**

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only significant coefficients of the variables under examination are listed.

Central bank communication and its media representation

- With regard to communications originating from central banks, financial markets do not absorb news by themselves
- Rather, financial market actors rely on media reports delivered via news agencies
- Although speeches have been given during trading hours, financial markets react with a time lag
- News agencies perform the role of a filter even when the Chairman of the FOMC is talking

Central bank communication and its media representation

- In spite of the collinearity between the two series of news variables, the E&F media-based indicator remains significant
- Markets react to news conveyed via the news agencies, even if there are no formal central bank communications as covered by our data set
- News originating from speeches and conveyed by the media drive financial markets more than media reports of question and answer sessions and interviews

7. Conclusions and further research

- Speeches by Fed members have an effect on financial markets in the US but their individual effects are smaller than that of formal methods of communication
- Taking into account the higher frequency of less formal methods of communication, these are at least as important for financial market movements.
- Most significantly affected are bond markets, while there is little impact on returns on foreign exchange and stock markets
- Fed Governing Board members have a larger influence than non-board members

Conclusions and further research

- Voting members have a larger influence than non-voting members
- On average, conditional volatility of returns decreases after any type of central bank communication
- Our results suggest that financial analysts or traders do not directly react to speeches.
- Rather, they rely on the media to tell them which communication events require attention
- This provides an avenue of further research

Conclusions and further research

- Analysis of spill-over effects of US central bank communication on financial markets in other countries
  - … caused by financial market interactions with emerging market economies
    - Emerging Markets
  - … caused by specific monetary dependency via currency boards
    - Argentina (until February 2002)
  - … caused by specific real economic integration/dependency
    - Canada

- Analysis of explanatory power of informal methods of communication with regard to changes in main refinancing rates

Bridge to second paper:

- Some open questions:
  - Are financial markets correct in concentrating on media reports?
  - Put differently, do communications help with predicting Fed interest rate decisions?
  - Are speeches more helpful than reports by newswire agencies?

Philipps Universität Marburg

Does FOMC Communication Help Predicting Federal Funds Target Rate Changes?

Bernd Hayo (Philipps-University Marburg)

Matthias Neuenkirch (Philipps-University Marburg)

Motivation

- Increasing importance of central bank communication

- Woodford (2005, p. 55):

  "The increased willingness of the FOMC under the Chairmanship of Alan Greenspan to speak openly about both current policy decisions and the Committee's view of likely future policy has greatly increased the ability of markets to anticipate Fed policy."

Research Questions

- Does the Fed’s informal communication actually contain useful information about future monetary policy that agents could not have acquired otherwise?
- Put differently: Does Fed communication provide information additional to that already incorporated in a real-time forward-looking Taylor rule?

Literature

Communication as predicting tool

- Pakko (2005): Post-meeting statements useful for forecasting U.S. target rate changes.
- Jansen and de Haan (2008): Statements about the ECB main refinancing rate and future inflation are significantly related to interest rate decisions.

Financial market data as predicting tool

- Major drawback: endogeneity
- Kauppi (2007), Piazzesi (2005), Krueger and Kuttner (1996), …

Data

- Examination of post-meeting statements, monetary policy reports, testimonies, speeches from 1998–2006
- Indicator variables with two categories: likely indication of an increase (MP+/EO+) or a decrease (MP–/EO–) in the federal funds target rate.
- Ternary variable for every communication event (+1/0/–1).
- Indicator capturing the monetary policy stance over the entire inter-meeting period (75 target rate decisions): Net out instances of tighter and looser monetary policy inclinations and code indicator accordingly.

Econometric Methodology

- Augmented Real-Time Forward-Looking Taylor (1993) Rule:

$$(1)\ \Delta i_t^* = \alpha \Delta i_{t-1} + \beta_1 \Delta Inflation\ Expectations_t + \beta_2 ISM\ Gap_t + \gamma_1 Last\ Statement_t + \gamma_2 Comm.Indicator_t + \varepsilon_t$$

- Ordered Probit Model

$$\Pr[\Delta i_t = -1 | z_t] = \Phi(\tau_1 - z_t'\beta)$$
$$\Pr[\Delta i_t = 0 | z_t] = \Phi(\tau_2 - z_t'\beta) - \Phi(\tau_1 - z_t'\beta)$$
$$\Pr[\Delta i_t = 1 | z_t] = \Phi(\tau_2 - z_t'\beta)$$

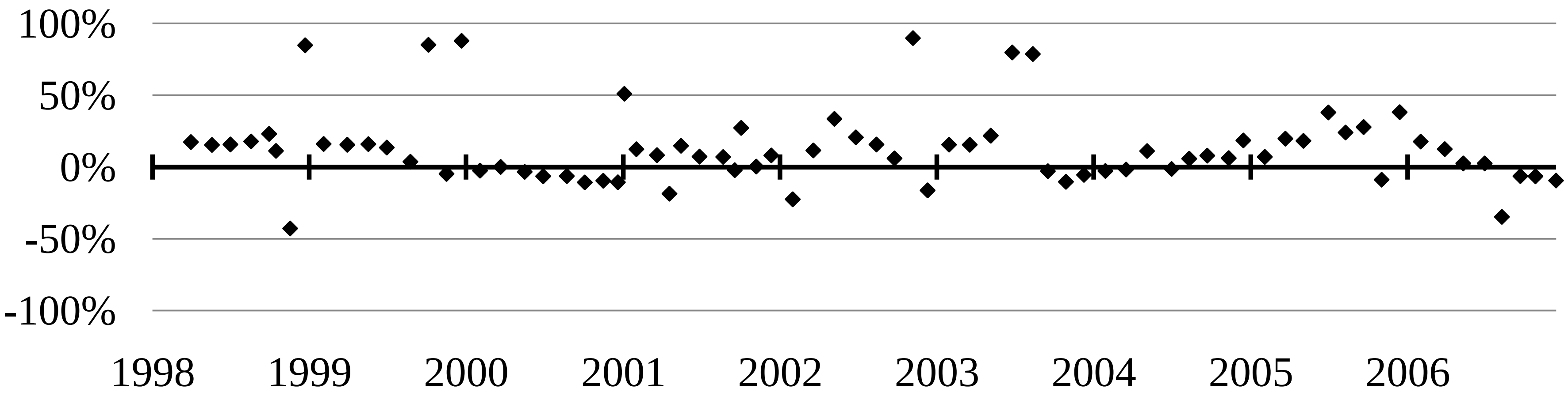
Results

	(1) Taylor Rule	(2) Communication	(3) Joint Model
Last Rate Decision	1.94***	1.80***	2.24***
ISM Gap	0.07**	---	0.07*
Δ(Inflation Expectations)	0.64*	---	0.80*
Last Statement	---	2.84***	3.31***
Communication Indicator	---	1.91***	1.99**
Lower Threshold	-1.58***	-2.21***	-3.13***
Upper Threshold	1.28***	5.38***	6.34***
LR Statistic	47.74***	24.75***	29.06***
Pseudo Log-Likelihood	-39.88	-21.11	-23.5
Pseudo R^2	0.49	0.70	0.73

Average Marginal Effects

	Prob[Rate Cut]	Prob[No Change]	Prob[Rate Hike]
(1) Taylor Rule			
Last Rate Decision	-0.29***	0.04	0.26***
ISM Gap	-0.01**	0.00	0.01**
Δ(Inflation Expectations)	-0.11*	0.03	0.08*
Correct Predictions	12/16	29/36	17/23
(2) Communication			
Last Rate Decision	-0.12**	0.05	0.07***
Last Statement	-0.19***	0.10	0.10**
Communication Indicator	-0.12**	0.05	0.07***
Correct Predictions	14/16	32/36	19/23
(3) Joint Model			
Last Rate Decision	-0.13*	0.06	0.07***
ISM Gap	0.00	0.00	0.00
Δ(Inflation Expectations)	-0.04	0.01	0.02
Last Statement	-0.21***	0.11	0.10***
Communication Indicator	-0.11**	0.05	0.06***
Correct Predictions	14/16	32/36	19/23

Improvements in-sample



Philipps Universität Marburg

… and out-of-sample

i. Using rolling-window estimations that update parameters in every period

	(1) Taylor Rule	(2) Communication	(3) Joint Model
Target Rate Cuts	0/1	1/1	1/1
No Change in Target Rate	11/14	13/14	10/14
Target Rate Hikes	5/17	16/17	15/16
All Rate Changes	16/32	30/32	26/32

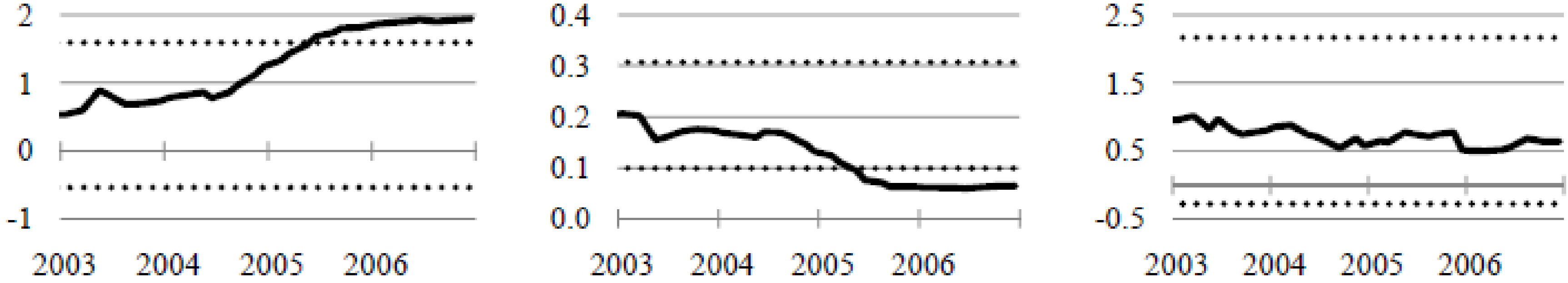
… and out-of-sample

ii. Estimating parameters over the period 1998–2002 and deriving predictions by plugging in values of the relevant variables in each period.

	(1) Taylor Rule	(2) Communication	(3) Joint Model
Target Rate Cuts	1/1	1/1	1/1
No Change in Target Rate	11/14	13/14	9/14
Target Rate Hikes	2/17	16/17	4/17
All Rate Changes	14/32	30/32	14/32

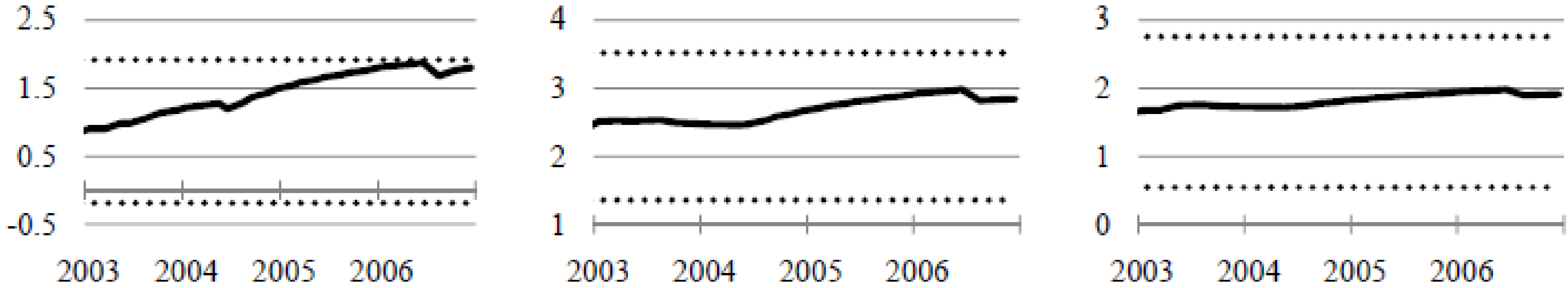
Parameter Stability (Chow-tests)

(1) Taylor Rule



Last Rate Decision | ISM Gap | Δ(Inflation Expectations)

(2) Communication



Last Rate Decision | Last Statement | Communication Indicator

Philipps Universität Marburg

Further Specifications

	(4)	(5)	(6)	(7)
Last Statement	---	2.88***	3.37***	2.67***
Last Stat. Bias/Balance	3.32***	---	---	---
Last Stat. Forward-Looking	3.3***	---	---	---
Communication Indicator	1.99**	2.09**	1.85**	---
MPR	---	---	---	-0.13
Testimonies	---	---	---	0.23
BOG Speeches	---	---	---	1.1**
Presidents' Speeches	---	---	---	1.21**
Inter-Meeting Moves	---	8.5***	---	---
Unambiguous Communication	---	---	0.64	---

	(8)	(9)	(10)
Comm. Indicator	0.913**	---	0.974**
Comm. Indicator News Agency Reports	---	0.772	0.811

Conclusions

Including communication variables into a Taylor rule…

- … provides a significant and robust explanation of the Fed’s target rate changes.
- … helps predicting seven additional target rate changes compared to a Taylor rule.
- … increases the probability of making correct forecasts by an average of 13 percentage points.
- … generates quite accurate out-of-sample forecasts.
- … provides estimates which are stable over time.

Conclusions

- Speeches by BOG members and regional presidents have a statistically significant and equal-sized effect.
- The infrequency of monetary policy reports and testimonies tends to make their impact insignificant.
- A change in Fed terminology in post-meeting statements does not result in greater predictability.
- Results are robust when controlling for inter-meeting target rate changes.
- Univocality has a positive but insignificant impact.
- Our communication indicator performs better than an indicator derived from news agency reports.

Thank you for your attention!

- Testimony of Chairman Alan Greenspan "The Economic Outlook before the Joint Economic Committee, U.S. Senate (April 21, 2004)

  […] The economy appears to have emerged around the middle of last year from an extended stretch of subpar growth and entered a period of more vigorous expansion. After having risen at an annual rate of 2-1/2 percent in the first half of last year, real GDP increased at an annual pace of more than 6 percent in the second half. […] Although real GDP is not likely to continue advancing at the same pace as in the second half of 2003, recent data indicate that *growth of activity has remained robust* thus far this year. […] As I have noted previously, *the federal funds rate must rise at some point* to prevent pressures on price inflation from eventually emerging. […]
- Coding:

  Testimony / Alan Greenspan / Economic Outlook / Positive and

  Testimony / Alan Greenspan / Monetary Policy / Tightening