Analyzing the News Content of Media Reports on Inflation

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12th International Agenda Setting Conference
Lucerne, October 8th, 2011

Motivation

- Following Carroll (2003), growing evidence for important role of media reports to explain inflation expectations

- Carroll: More media reports on inflation pushes individuals' inflation expectations closer to the rational inflation expectations of professional forecasters (volume channel)

- Lamla/Lein (2008): the content of articles on inflation introduces a media bias, pushing expectations away from the rational forecast (tone channel)
  ⇒ However: Hardly any work on determinants of media reports

Importance to understand what drives media reports:

- Media reports as "good" transmitter of information?

- Or do the media deliver distorted information, leading to biased and inefficient inflation expectations?

More on the Literature

Linking three strands of the literature:

- ▶ Economics: Using media reports to explain inflation expectations

- ▶ Economics: Analyzing the news content of media reports about monetary policy (Berger et al. 2010), the political bias of media reports (Larcinese et al. 2007, Gentzkow/Shapiro 2010), ...

- ▶ Communication research: Analyzing the news content of media reports: inflation understood as "obtrusive issue", i.e. a topic that individuals primarily perceive through personal experience

Research Questions and Plan of the Paper

(A) Asymmetric Reporting: Do the media report more on rising inflation than on falling inflation?

(B) News Content: What are the main determinants of media reports on inflation?

(C) Interaction between the subjective tone of reports and the total number of published articles

(D) Merging all aspects coded to get a news intensity variable

(E) Robustness Checks: Different time aggregation, different inflation rates

Own Contribution

- Media reports on inflation in *The New York Times* and the *Svenska Dagbladet* for 1998–2008

- Three vars: total no of articles, objective tone, subjective tone

- All articles vs. articles only referring to the home country

- Analysis how media reports are linked to real economic figures

Results

- Asymmetric Reporting: Media react differently to rising and falling inflation, core inflation more important than headline inflation

- Differences between countries.
  US: positive core inflation, SK: negative core inflation

- Differences between all articles and articles about home country.
  US: vo_inc, vol_dec: more information if US articles are used
  SK: nearly no information in articles about Sweden only

- Interaction between vol and tone: negative judgment by journalists increases coverage

# The Data: *The New York Times* and *Svenska Dagbladet*

Table: Dependent Variables

|	
vol_articles	all articles about inflation
vol_increasing	articles with "increasing inflation", "inflation high level", "increasing wages"
vol_decreasing	articles with "decreasing inflation", "inflation low level", "decreasing wages", "deflation"

Table: Summary of Media Articles

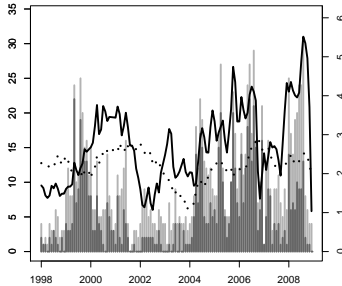|	US	SK
vol_articles	2847	906
vol_articles_us/sk	1933	392
domestic/all	67.9%	43.3%
vol_increasing	1282	333
vol_increasing_us/sk	712	133
domestic/all	55.5%	39.9%
vol_decreasing	854	247
vol_decreasing_us/sk	541	135
domestic/all	63.3%	54.7%

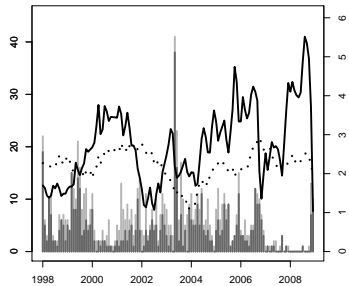**All Articles US**
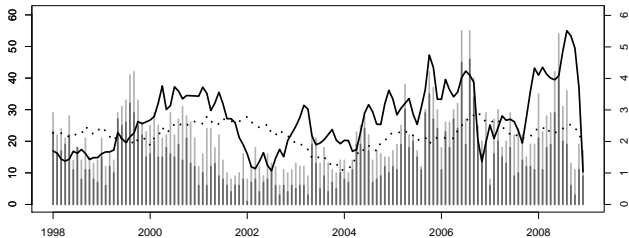
All Articles SK
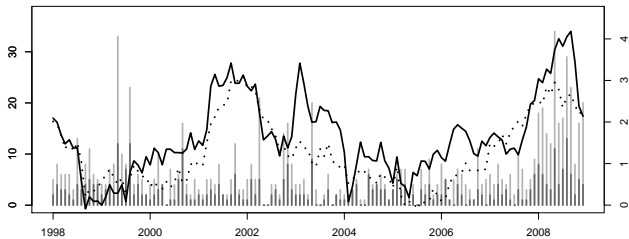
Increasing Inflation US

Decreasing Inflation US

Increasing inflation SK
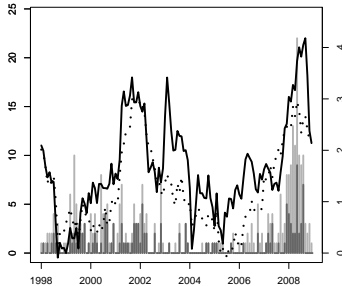
Decreasing Inflation SK
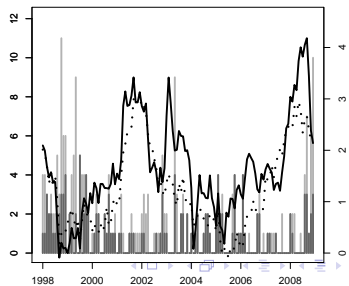
(A) Asymmetric Reporting

- ▶ Do the media emphasize negative news (rising inflation) over positive news (falling inflation)?
- ▶ Compute variables $\Delta^+\pi_t$ and $\Delta^-\pi_t$, containing positive and negative changes of inflation, respectively
- ▶ Asymmetric reporting, if $\beta_{\Delta^+\pi_t} \neq \beta_{\Delta^-\pi_t}$
- ▶ Estimation with Poisson Autoregressive (PAR)-model
- ▶ Compare effects of headline and core inflation, and distinguish between all articles and articles about home country

(A) Results: All Articles

	US		SK	
	all countries	US only	all countries	SK only
π_t^{ALL}	4.20***	1.38	0.01	-0.33
	(2.08, 6.27)	(-1.00, 4.14)	(-0.73, 0.82)	(-1.22, 0.57)
π_t^{CORE}	-3.18	-5.46	0.21	0.65
	(-8.12, 2.24)	(-10.77, 0.32)	(-0.61, 1.00)	(-0.26, 1.54)
$\Delta^+\pi_t^{ALL}$	1.40	9.78	-0.17	1.10
	(-7.09, 9.58)	(-0.29, 18.74)	(-2.31, 2.11)	(-1.57, 3.71)
$\Delta^-\pi_t^{ALL}$	1.42	-1.49	1.37	2.38
	(-5.65, 8.03)	(-6.22, 3.18)	(-1.33, 3.97)	(-0.52, 5.23)
$\Delta^+\pi_t^{CORE}$	34.03**	41.83*	0.51	0.17
	(6.87, 63.63)	(2.17, 76.79)	(-2.48, 3.40)	(-3.49, 4.25)
$\Delta^-\pi_t^{CORE}$	-20.48	-45.04*	-2.40*	-5.48***
	(-50.55, 9.31)	(-80.63, -0.95)	(-4.38, -0.49)	(-7.63, -3.16)
const	55.14	34.15	11.12	2.64
	(41.31, 69.32)	(21.24, 49.11)	(8.59, 14.10)	(1.37, 4.04)
$\sum_{i=1}^{p}\rho_i$	0.67	0.77	0.25	0.23
log(L)	-432.90	-414.90	-356.18	-275.39
AIC	889.81	853.80	738.37	564.78
d.f.	119	119	118	124
χ^2	115.80	142.70	21.90	7.18
p-value	0.000	0.000	0.003	0.007

(A) Results: Articles on Increasing Inflation

	US		SK	
	all countries	US only	all countries	SK only
π_t^{ALL}	2.30***	0.16	-0.53	-0.14
	(1.20, 3.31)	(-0.15, 0.45)	(-1.44, 0.22)	(-0.49, 0.24)
π_t^{CORE}	-0.96	0.05	1.17**	0.73***
	(-3.34, 1.50)	(-0.69, 0.83)	(0.23, 2.30)	(0.34, 1.12)
$\Delta^+\pi_t^{ALL}$	2.69	-0.24	-2.27	-0.23
	(-1.10, 6.33)	(-1.76, 1.13)	(-6.09, 2.42)	(-1.80, 1.11)
$\Delta^-\pi_t^{ALL}$	7.25*	1.39	4.30**	1.71**
	(0.65, 13.33)	(-0.23, 2.91)	(0.93, 7.43)	(0.47, 3.24)
$\Delta^+\pi_t^{CORE}$	11.65*	3.86**	-0.96	0.99
	(0.56, 23.46)	(1.38, 6.20)	(-5.52, 4.81)	(-0.55, 2.75)
$\Delta^-\pi_t^{CORE}$	-2.19	-2.26	-2.45	-3.77***
	(-17.47, 11.22)	(-8.10, 3.03)	(-9.35, 3.82)	(-5.11, -2.65)
const	14.38	6.62	1.52	-0.94
	(8.45, 21.00)	(4.11, 9.65)	(0.03, 3.27)	(-1.35, -0.40)
$\sum_{i=1}^p \rho_i$	0.54	0.26	0.55	0.26
log(L)	-392.06	-336.89	-236.26	-165.43
AIC	808.12	697.78	494.51	348.86
d.f.	119	119.00	120	122
χ^2	64.90	23.77	65.01	5.09
p-value	0.000	0.001	0.000	0.165

(A) Results: Articles on Decreasing Inflation and Deflation

	US		SK	
	all countries	US only	all countries	SK only
π_t^{ALL}	0.52	-0.45**	-0.39	-0.27
	(-0.23, 1.17)	(-0.74, -0.14)	(-1.05, 0.29)	(-0.67, 0.19)
π_t^{CORE}	-2.11**	-0.81*	0.43	-0.11
	(-4.36, -0.81)	(-1.51, -0.13)	(-0.28, 1.08)	(-0.58, 0.36)
$\Delta^+\pi_t^{ALL}$	-10.05**	-0.27	-1.61	-1.17
	(-20.13, -4.30)	(-1.67, 1.24)	(-4.10, 0.89)	(-2.72, 0.38)
$\Delta^-\pi_t^{ALL}$	-1.00**	-1.19***	1.72	1.20
	(-2.51, -0.32)	8-1.90, -0.44)	(-0.34, 3.80)	(-0.07, 2.49)
$\Delta^+\pi_t^{CORE}$	17.77**	2.14	-0.60	0.90
	(9.23, 30.37)	(-2.22, 6.60)	(-4.05, 2.98)	(-1.42, 3.00)
$\Delta^-\pi_t^{CORE}$	-22.14***	-2.41	-2.99***	-3.02***
	(-37.04, -12.93)	(-6.67, 1.79)	(-4.89, -1.28)	(-4.12, -1.98)
const	4.37	6.53	1.41	0.53
	(0.87, 14.54)	(4.71, 8.67)	(0.64, 2.35)	(0.01, 1.12)
$\sum_{i=1}^{p}\rho_i$	0.77	0.15	0.33	0.27
log(L)	-345.05	-312.70	-230.47	-176.29
AIC	708.09	639.41	474.94	366.59
d.f.	122	124	124	124
χ^2	108.36	33.55	15.72	6.10
p-value	0.000	0.000	0.000	0.013

(B) News Content: How are media reports linked to economic figures?

Extending (A) by a number of explanatory variables:

Both Countries

- ► Prices: inflation rates, long-run average of inflation, oil price, stock price index
- ► Interest Rate: Federal Funds rate(Fed), Repo Rate(Riksbank)
- ► Central Bank Chairman: US(1 for Greenspan, 0 for Bernanke), SK(Bäckström 1994-2002, Heikensten 2003-2005, Ingves 2006-)
- ► CB Communication: statement, meeting scheduled, conference call
- ► Inflation Expectations

SK

- ► Inflation Perceptions
- ► Inflation Target: 1 if inflation above 2%

(B) News Content: Results

	All Articles		US only	
	(1)	(2)	(1)	(2)
$\Delta^+\pi_t^{ALL}$	-2.65	-2.37	1.77	1.67
	(-7.20, 2.14)	(-6.16, 1.55)	(-2.25, 5.64)	(-2.18, 5.38)
$\Delta^-\pi_t^{ALL}$	-1.29	-1.31	-1.84	-1.49
	(-5.49, 2.91)	(-4.51, 1.68)	(-5.61, 1.74)	(-4.83, 1.82)
$\Delta^+\pi_t^{CORE}$	24.38**	17.69**	23.56**	18.97**
	(7.77, 41.47)	(4.10, 32.17)	(8.38, 38.02)	(5.79, 33.44)
$\Delta^-\pi_t^{CORE}$	-17.70	-11.13	-27.23***	-22.00**
	(-36.79, 0.34)	(-26.92, 3.90)	(-42.82, -11.49)	(-37.30, -6.80)
π_t above average	9.89***	8.25***	8.58***	7.88***
	(5.60, 14.01)	(4.59, 11.89)	(4.71, 12.61)	(4.04, 11.53)
price variability	-1.82**	-1.75**	-2.47***	-2.35**
	(-3.14, -0.54)	(-2.88, -0.57)	(-3.68, -1.11)	(-3.59, -1.18)
$\log(S\&P500)$	20.97***	-	14.12***	-
	(12.41, 30.51)	-	(5.90, 22.15)	-
Fed Funds Rate	-	1.81***	-	1.12***
	-	(1.29, 2.34)	-	(0.58, 1.66)
ΔFed Funds Rate	6.87*	5.13	7.78**	7.74**
	(0.07, 13.11)	(-0.19, 10.55)	(1.95, 13.61)	(2.21, 13.09)
conference call	-5.81**	-5.72**	-6.78**	-6.68***
	(-10.66, -1.31)	(-9.36, -2.07)	(-11.46, -2.02)	(-10.71, -2.42)
chair	1.54	-0.26	1.92	0.70
	(-2.22, 4.93)	(-2.90, 2.29)	(-1.23, 4.95)	(-1.95, 3.41)
π_{t-1}^{exp}	2.51*	3.69***	1.54	2.30*
	(0.41, 4.86)	(1.84, 5.52)	(-0.66, 3.38)	(0.33, 4.25)
const	-94.70	46.86	-72.12	24.91
	(-166.05, -32.43)	(38.57, 55.43)	(-128.65, -12.47)	(16.49, 34.01)
$\sum_{i=1}^{6}\rho_i$	0.40	0.25	0.50	0.44
Log Likelihood	-409.7	-406.5	-394.4	-394.1
AIC	853.3	846.9	822.9	822.1
χ^2: H_0: Poisson	0.0000	0.0002	0.0000	0.0000
d.f.	114	114	114	114

(B) News Content: Results

	All Articles		SK only	
	(1)	(2)	(1)	(2)
$\Delta^+\pi_t^{ALL}$	0.83	0.86	0.69	0.92
	(-1.17, 2.77)	(-1.32, 2.79)	(-2.15, 3.86)	(-2.05, 3.80)
$\Delta^-\pi_t^{ALL}$	0.68	0.93	4.14	3.85
	(-1.96, 3.16)	(-1.36, 3.30)	(-0.37, 7.82)	(-0.20, 7.60)
$\Delta^+\pi_t^{CORE}$	0.17	0.19	-0.39	-0.72
	(-2.86, 3.14)	(-2.76, 3.19)	(-4.42, 3.66)	(-4.94, 3.43)
$\Delta^-\pi_t^{CORE}$	-1.50	-2.21*	-5.72**	-5.62***
	(-3.91, 0.70)	(-4.23, -0.08)	(-8.53, -2.36)	(-8.58, -2.55)
π_t above average	-0.01	0.00	-0.15	-0.12
	(-0.99, 0.88)	(-0.83, 0.96)	(-1.29, 0.95)	(-1.17, 1.05)
log(share price)	-0.74	-0.40	-0.98	-0.97
	(-2.71, 1.23)	(-2.29, 1.37)	(-3.75, 1.86)	(-3.79, 2.13)
ΔRepo Rate	-1.79**	-1.26	-1.34	-1.29
	(-3.16, -0.51)	(-2.53, 0.03)	(-3.15, 0.62)	(-3.27, 0.74)
statement	-0.30	-0.26	-0.84	-0.77
	(-1.14, 0.61)	(-1.01, 0.56)	(-1.93, 0.38)	(-1.93, 0.44)
scheduled	2.67***	1.97*	0.28	0.39
	(1.01, 4.47)	(0.34, 3.91)	(-2.50, 3.37)	(-2.74, 3.56)
chair$_2$	-2.91***	-2.69***	-1.70*	-1.59*
	(-4.43, -1.62)	(-4.14, -1.29)	(-3.25, -0.18)	(-3.20, -0.15)
log(oil price)	1.59*	1.60*	0.30	0.46
	(0.23, 2.89)	(0.21, 2.79)	(-1.34, 2.04)	(-1.15, 1.91)
π_{t-1}^{exp}	1.03**	-	0.23	-
	(0.20, 1.80)	-	(-1.22, 1.47)	-
π_{t-1}^{perc}	-	0.75**	-	0.03
	-	(0.28, 1.20)	-	(-0.88, 0.89)
const	6.60	5.21	8.83	8.71
	(-5.18, 20.99)	(-5.78, 17.60)	(-8.42, 26.07)	(-9.73, 26.62)
$\sum_{i=1}^{7}\rho_i$	0.17	0.13	0.38	0.37
Log Likelihood	-349.4	-348.5	-257.7	-257.8
AIC	736.9	735.0	553.5	553.5

(C) Interaction between Volume and Tone

Journalists' subjective judgment: Data

- explicit coding: VALUATION
  example: "hyperinflation destroys the savings of the citizens"

- implicit coding: CONTEXT
  example: "inflation has been consistently higher than in the other OECD countries"

Transformation:

- Original coding: 0: neutral, 1: positive, 2: rather positive, 3: ambivalent, 4: rather negative, 5: negative

- recoding: -2: negative, -1: rather negative, 0: neutral and ambivalent, 1: rather positive, 2: positive

- average valuation of each article, monthly sum

- divided by maximum values multiplied by 100. range $\{-100, +100\}$

(C) Interaction between Volume and Tone: Estimation strategy

Two-Stage-Regression

1. Explaining VALUATION/CONTEXT with explanatory variables, keeping the residuals

2. Residuals as variable capturing the journalists' judgment of inflation that cannot be explained by changes in the economy:
   $\Rightarrow$ news shock

3. Test whether this news shock increases the number of media reports:
   Journalists write more about inflation if they consider inflation as a problem, no matter whether this is reflected in the data

(C) Interaction: Results

	US: all articles	
	valuation	context
$\Delta^{+}\pi_t^{ALL}$	-4.431	-3.404
	(7.175)	(7.499)
$\Delta^{-}\pi_t^{ALL}$	1.180	0.508
	(3.704)	(3.428)
$\Delta^{+}\pi_t^{CORE}$	39.53**	34.11*
	(17.99)	(19.04)
$\Delta^{-}\pi_t^{CORE}$	-29.23	-23.57
	(18.17)	(18.35)
π_t above average	6.135*	5.758*
	(3.268)	(3.406)
price variability	-0.537	-0.767
	(1.187)	(1.123)
$\log(S\&P500)$	16.38*	19.31**
	(9.627)	(8.854)
ΔFed Funds Rate	6.753	9.475*
	(5.099)	(5.232)
conference call	-5.782	-5.933
	(3.973)	(3.821)
chair	-4.696	-4.200
	(3.796)	(4.016)
dep var$_{t-1}$	0.341***	0.377***
	(0.118)	(0.0899)
dep var$_{t-2}$	0.127	
	(0.128)	
res_val/res_con$_{t-1}$	20.02*	13.95*
	(11.84)	(7.946)
const	-97.14	-114.3*
	(66.73)	(62.02)
N	130	131
R^2	0.521	0.510

(D) Weighted Volume of Articles

Hypothesis: If articles are weighted according to their importance, they should carry more information than a simple sum of articles

index	values
section	5 - title page, 4 - business, page 1, 3 - politics/news or opinion
	2 - business, 1 - other department
status	2 - main topic, 1 - additional topic
style	5 - report, 4 - brief report, 3 - opinion, editorial, guest story, 2 - news report,
	1 - reportage, documentary, satirical text
author	5 - editorial staff, economic section, 4 - editorial staff, political or news section,
	3 - Bloomberg News, 2 - press agencies, 1 - others (politician, businessman,...)
source	5 - Fed, 4 - journalists, 3 - US government, 2 - ECB, 1 - others
time	5 - present, 4 - present and future, 3 - future, 2 - past related to present, past
area	6 - US in general, 5 - US states, 4 - Europe, 3 - Asia, 2 - South America, 1 - others
number	12 - top left, ..., 1 - bottom right
theme	4 - increasing/decreasing inflation, deflation, 3 - prices in general,
	2 - oil prices, food prices, petrol, energy, 1 - specific prices
valuation	6 - rejection, 5 - more rejection, 4 - agreement, 3 - more agreement,
	2 - ambivalent, 1 - neutral
context	6 - negative, 5 - rather negative, 4 - positive, 3 - rather positive,
	2 - ambivalent, 1 - neutral

Summary: The News Content of Media Reports

a
- largest effects from prices on media reports in case of *total number of articles*, other articles react very little
- asymmetric effect: main determinants are positive and negative changes in core inflation

b
- news content: inflation above average, stock prices, changes of Federal Funds Rate, conference call, oil price
- feedback effect from (lagged) inflation expectations and perceptions

c
- news shock effect: more negative judgment, not linked to fundamentals, leads to more articles

all parts
- Results differ with respect to the country the articles refer to, and also between the US and Sweden

Extensions

This paper:

- ▶ Dynamic factor analysis to merge all the information in the data set
- ▶ Robustness checks: different time aggregation, different inflation rates

Future Work:

- ▶ Avoiding aggregation problem, analyze articles directly published after CPI release date (as proposed by Shiller 2005)
- ▶ Linking Google search data (demand and supply), television data, and newspaper articles
- ▶ Analyzing differences of news content between single news papers and TV channels

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