EU WORKSHOP

Directorate General Economic and Financial Affairs

Evaluation of the forecast content of the bi-annual investment survey

Brussels: Thursday, 13 November 2014

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Business and consumer surveys and short-term forecast (ECFIN A4.2)

Introduction

- **Relevant but difficult task**
  - E.g. Oliner et al. (1997), Rapach & Wohar (2007), Baghestani (2012)

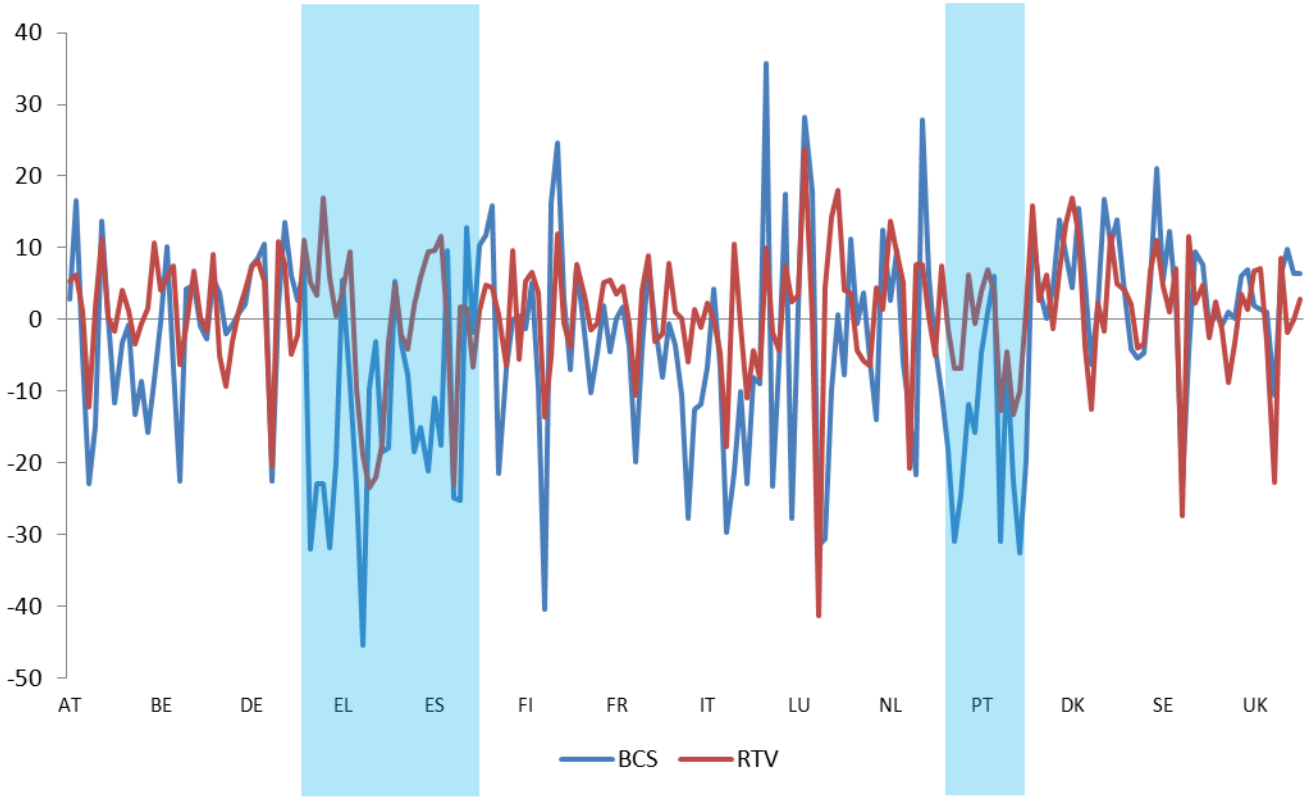
- **Point of departure**
  - Usefulness of the BCS Investment survey
  - Limited knowledge
    - DE (Abberger, 2005); FR (Ferrari, 2005); AT (Brunner & Schwarz, 2012), Big 4 EA countries + EA aggregate (Friz & Gayer, 2007)
  - Reference series sub-optimal
  - Mixed evidence: + Friz and Gayer (2007), - Brunner & Schwarz (2012)

A first look at the data

- **Data**
  - 2000-2013
  - AT, BE, DE, EL, ES, FI, FR, IT, LU, NL, PT, DK, SE, UK
- **BCS forecasts**
  - Bi-annual manufacturing investment plans (**BCS**)
  - Autumn t: Yt (**A1**); Spring t: Yt (**S1**); Autumn t: Yt+1 (**A2**)
- **Reference series**
  - Investment in equipment (mach. + transp.; ESA95) (**RTV**)
  - Spring t for Yt-1
- **Competing forecasts**
  - Naïve models: **CG** and **RW** [Yt-1 (A1, S1); Yt-2 (A2)]
  - Spring and Autumn DG-ECFIN forecasts (**ECF**); A1, S1, A2

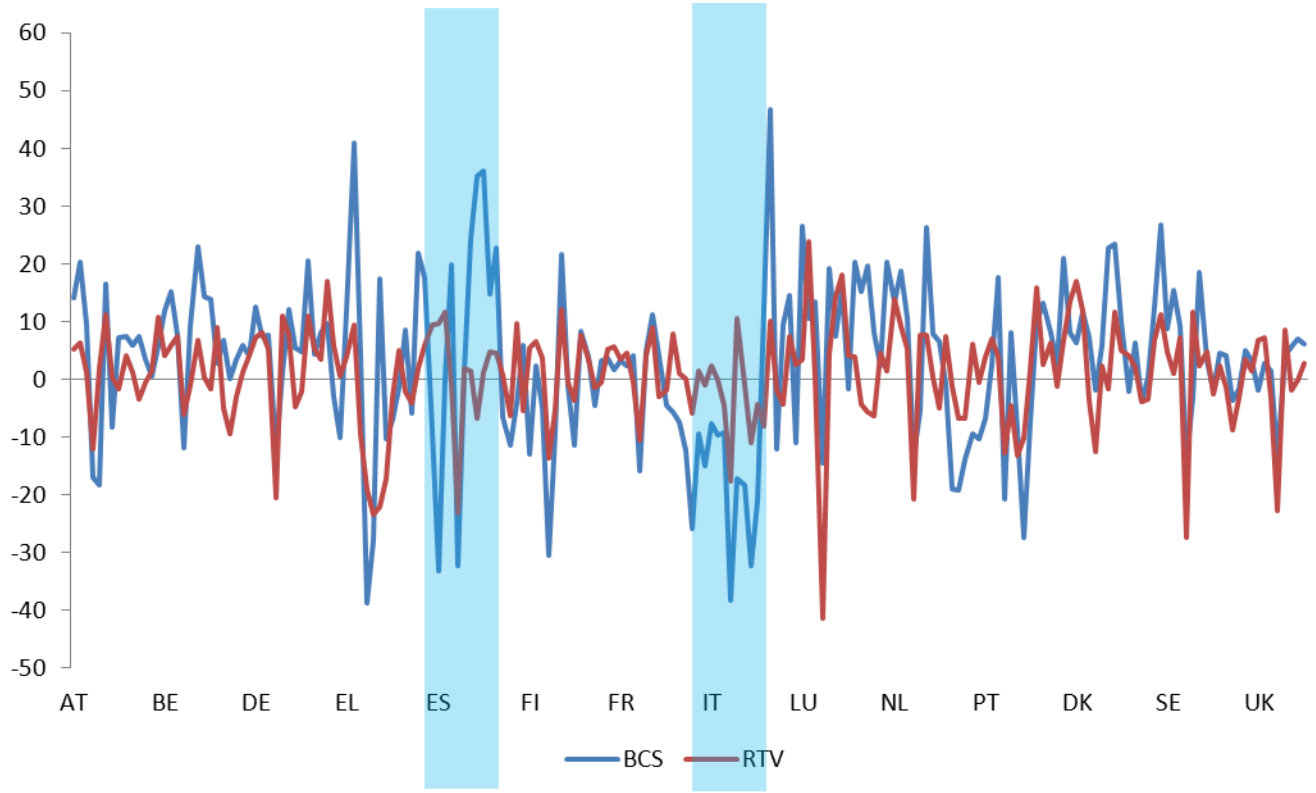
A first look at the data

A1: Autumn t for year t



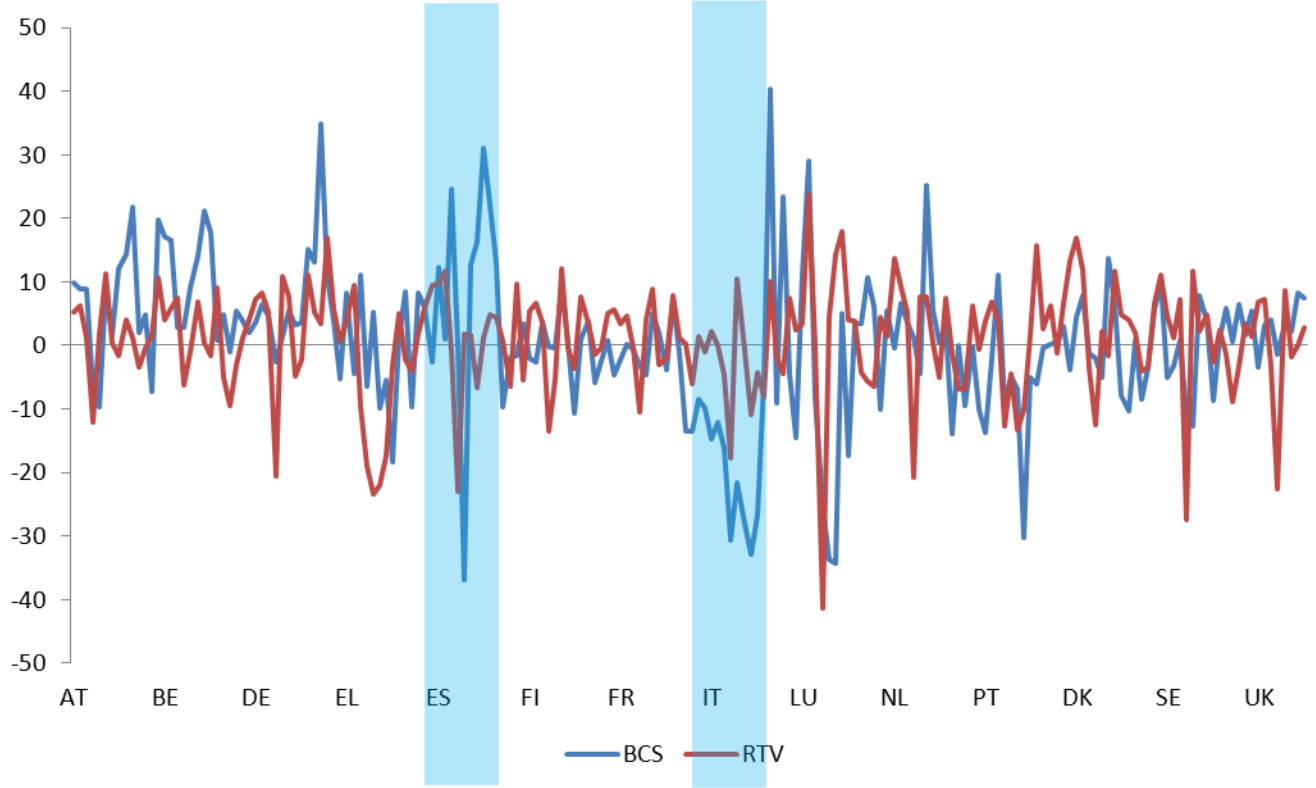
A first look at the data

S1: Spring t for year t



A first look at the data

A2: Autumn t for year t+1



Co-movements

	Correlations		
	A1	S1	A2
AT	0.76	0.67	0.49
BE	0.45	0.48	0.35
DE	0.80	0.71	0.52
EL	0.11	0.60	0.41
ES	0.05	0.10	-0.01
FI	0.62	0.66	0.32
FR	0.87	0.85	0.39
IT	0.53	0.79	0.61
LU	0.55	0.47	0.35
NL	0.31	0.47	0.03
PT	0.77	0.57	0.49
DK	0.49	0.31	0.04
SE	0.76	0.62	0.42
UK	0.70	0.77	0.21

Co-movements

Contingency table

- Growth rates (correlation)
- Acceleration rates (controlling for level shifts)

	RTV(<0)	RTV(≥0)
BCS(<0)	*n1*	*n2*
BCS(≥0)	*n4*	*n3*

	d.RTV(<0)	d.RTV(≥0)
d.BCS(<0)	*n1*	*n2*
d.BCS(≥0)	*n4*	*n3*

Outcome

- Correct/incorrect frequencies
  - *n1*s, *n3*s vs *n2*s & *n4*s
- Directional accuracy rates
  - $p(all) = (n1+n3)/(n1+n2+n3+n4)$
  - $p(up) = n3/(n2+n3)$
  - $p(down) = n1/(n1+n4)$
- Pesaran-Timmerman (1992) PT test of predictive failure

Co-movements

GROWTH RATES

	Frequencies				Directional accuracy rates			PT test	
	Correct		Incorrect						
	n1	*n3*	*n2*	*n4*	*p(all)*	*p(up)*	*p(down)*	*stat*	*pval*
A1	59	70	48	19	66%	59%	76%	23.2	0.000
S1	43	90	28	35	68%	76%	55%	20.0	0.000
A2	44	76	42	34	61%	64%	56%	8.3	0.004

ACCELERATION RATES

	Frequencies				Directional accuracy rates			PT test	
	Correct		Incorrect						
	n1	*n3*	*n2*	*n4*	*p(all)*	*p(up)*	*p(down)*	*stat*	*pval*
A1	66	58	28	30	68%	67%	69%	37.5	0.000
S1	66	59	27	30	69%	69%	69%	39.1	0.000
A2	59	46	40	37	58%	53%	61%	17.0	0.000

Forecast accuracy

	ME			MAE			RMSE		
	A1	S1	A2	A1	S1	A2	A1	S1	A2
AT	2.8	-0.9	-1.6	6.3	6.9	5.5	1.2	1.4	1.1
BE	6.7	-6.1	-9.2	8.0	7.7	**11.0**	**2.2**	**2.0**	**2.6**
DE	-2.1	-3.8	-2.4	4.5	6.1	6.4	0.6	0.8	0.9
EL	**14.7**	-4.2	-6.5	**19.6**	**12.1**	**12.7**	1.8	1.2	1.2
ES	8.5	-5.2	-4.4	**13.7**	**18.1**	**14.5**	**2.0**	**2.6**	**2.1**
FI	1.6	2.7	-0.7	10.4	9.7	7.6	1.8	1.6	1.3
FR	4.5	-0.1	2.8	4.9	2.8	4.7	1.1	0.7	1.1
IT	**10.4**	**14.8**	**14.3**	**11.0**	**14.8**	**14.3**	1.9	**2.2**	**2.4**
LU	5.4	-7.4	5.4	**15.2**	**14.8**	**18.2**	1.2	1.1	1.5
NL	0.2	**-10.0**	-3.2	9.8	**12.2**	9.7	1.4	1.6	1.3
PT	**13.9**	6.4	4.7	**14.2**	**10.8**	8.1	**2.2**	1.6	1.3
DK	-2.5	-5.3	4.5	6.3	8.5	8.8	0.9	1.2	1.3
SE	-0.4	-4.1	3.8	5.0	7.4	6.9	0.7	1.0	1.0
UK	-3.3	-2.3	-3.8	5.4	4.8	7.1	0.8	0.7	1.1

Forecast accuracy

- **Rationality: unbiasedness + efficiency**
  - Small and unpredictable FEs (Real. - Fcst)
  - **Pooling: Vuchelen & Gutierrez (2005); Vogel (2007)**

- **For A1 and S1**
  - $RVT(t) = c + \beta \times RVT(t-1) + \gamma \times [BCS(t)-RVT(t-1)]+e(t)$

- **For A2**
  - $RVT(t) = c + \beta \times RVT(t-2) + \gamma \times [BCS(t)-RVT(t-2)]+e(t)$

- **Hypotheses**
  - H1. Unbiasedness: $c=0, \beta=1, \gamma=1$
  - H2. CG model: $\beta=0, \gamma=0$
  - H3. RW alternative: $\gamma=0$
  - H4. Encompassing the RW model: $\beta=\gamma$

Forecast accuracy

- **For A1, S1:** $RVT(t) = c + \beta \times RVT(t-1) + \gamma \times [BCS(t)-RVT(t-1)] + e(t)$
- **For A2:** $RVT(t) = c + \beta \times RVT(t-2) + \gamma \times [BCS(t)-RVT(t-2)] + e(t)$

	A1	S1	A2
c	1.511	-0.372	0.562
	(0.468)	(0.486)	(0.750)
β	0.360	0.388	0.054
	(0.097)	(0.107)	(0.139)
γ	0.292	0.296	0.220
	(0.055)	(0.054)	(0.041)
H1 [pval]	[0.000]	[0.000]	[0.000]
H2 [pval]	[0.000]	[0.000]	[0.000]
H3 [pval]	[0.000]	[0.000]	[0.000]
H4 [pval]	[0.633]	[0.395]	[0.228]
adj. Rsq	0.217	0.244	0.089
F [pval]	[0.000]	[0.000]	[0.000]
DW	1.877	1.892	1.838
JB [pval]	[0.000]	[0.000]	[0.000]
N	182	182	168

- **Results**
  - H1. Unbiasedness: **rejected**
  - H2. CG model: **rejected**
  - H3. RW alternative: **rejected**
  - H4. Encompassing the RW model: **not rejected**

Comparison wrt DG-ECFIN forecasts

- **Pooling estimates**
  - Vuchelen & Gutierrez (2005); Vogel (2007)

- **For A1, S1 and A2**
  - $RVT(t) = c + \beta \times ECF(t) + \gamma \times [BCS(t)-ECF(t)]$

- **Hypotheses**
  - H5. No value added to DG-ECFIN forecasts: $\gamma=0$
  - H6. Encompassing DG-ECFIN forecasts: $\beta=\gamma$

Comparison wrt DG-ECFIN forecasts

- **For A1, S1, A2:** $RVT(t) = c + \beta \times ECF(t) + \gamma \times [BCS(t)-ECF(t)]$

	A1	S1	A2
c	0.475	-0.909	-1.796
	(0.393)	(0.491)	(0.640)
β	1.014	0.981	1.123
	(0.046)	(0.063)	(0.075)
γ	0.057	0.102	0.111
	(0.032)	(0.026)	(0.043)
H5 [pval]	[0.079]	[0.000]	[0.010]
H6 [pval]	[0.000]	[0.000]	[0.000]
adj. Rsq	0.789	0.585	0.261
F [pval]	0.000	0.000	0.000
DW	1.896	2.146	2.166
JB [pval]	[0.000]	[0.000]	[0.000]
N	196	196	196

- **Results**
  - H5. No value added to DG-ECFIN forecast: **rejected**
  - H6. Encompassing DG-ECFIN forecasts: **rejected**

Forecast combination

- **Three weights**
  - W1. Simple average between BCS and ECF (AVG1)
  - W2. Inverse of mean square errors (AVG2)
  - W3. Regression based weights (AVG3)

	A1		S1		A2	
	W1(ECF)	W1(BCS)	W2(ECF)	W2(BCS)	W3(ECF)	W3(BCS)
AVG1	0.50	0.50	0.50	0.50	0.50	0.50
AVG2	0.90	0.10	0.82	0.18	0.73	0.27
AVG3	0.94	0.06	0.90	0.10	0.89	0.11

- **For A1, S1 and A2 and for a given combination (AVG)**
  - $RVT(t) = c + \beta \times ECF(t) + \gamma \times [AVG(t) - ECF(t)]$

- **Hypotheses**
  - H7. Encompassing DG-ECFIN forecasts: $\beta = \gamma$

Forecast combination

- **For A1, S1, A2:** $RVT(t) = c + \beta \times ECF(t) + \gamma \times [AVG(t) - ECF(t)]$

		A1	S1	A2
H7 [pval]	AVG1	[0.000]	[0.000]	[0.000]
H7 [pval]	AVG2	[0.132]	[0.003]	[0.001]
H7 [pval]	AVG3	[0.995]	[0.936]	[0.803]

- **Results**
  - H7. Encompassing DG-ECFIN forecasts:
    - **rejected under W1, W2**
    - **not rejected for W3**

Final remarks

- **Summary**
  - Managers' forecasts not rational but informative
- **Robustness**
  - Pre-crisis (<2008) and from the crisis onwards
  - Control for "influential" countries
- **Further analysis**
  - Departures from the fully rational assumption
  - Role of revisions
- **Practical issues**
  - Cross-country heterogeneity in conducting the questionnaire
  - Closer look at the outcome of the survey
  - Use it!

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