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How to explain errors in budget balance forecasts in euro area countries? Real-time evidence based on IMF data

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Background

- Budget planning is always based on real-time information
- Real-time uncertainty of real GDP contributes to errors in fiscal policy
  - How to decompose nowcasted real GDP into a long-term trend (potential output) and a short-term business cycle (the output gap)?
- The financial crisis increased errors in forecasting
  - Substantial surprises in budget balances and other public sector finances
  - Unexpected debt accumulation

This study uses real-time information extensively

- Real-time analysis of budget balance (BB) forecasts in 11 euro area countries
- Annual real-time data from IMF WEO autumn publications 2003 – 2013
- Extensive use of real-time information
  - Budget balance
  - Real GDP
  - Output gap
  - Potential output
- Final (revised) data
  - IMF WEO autumn 2015

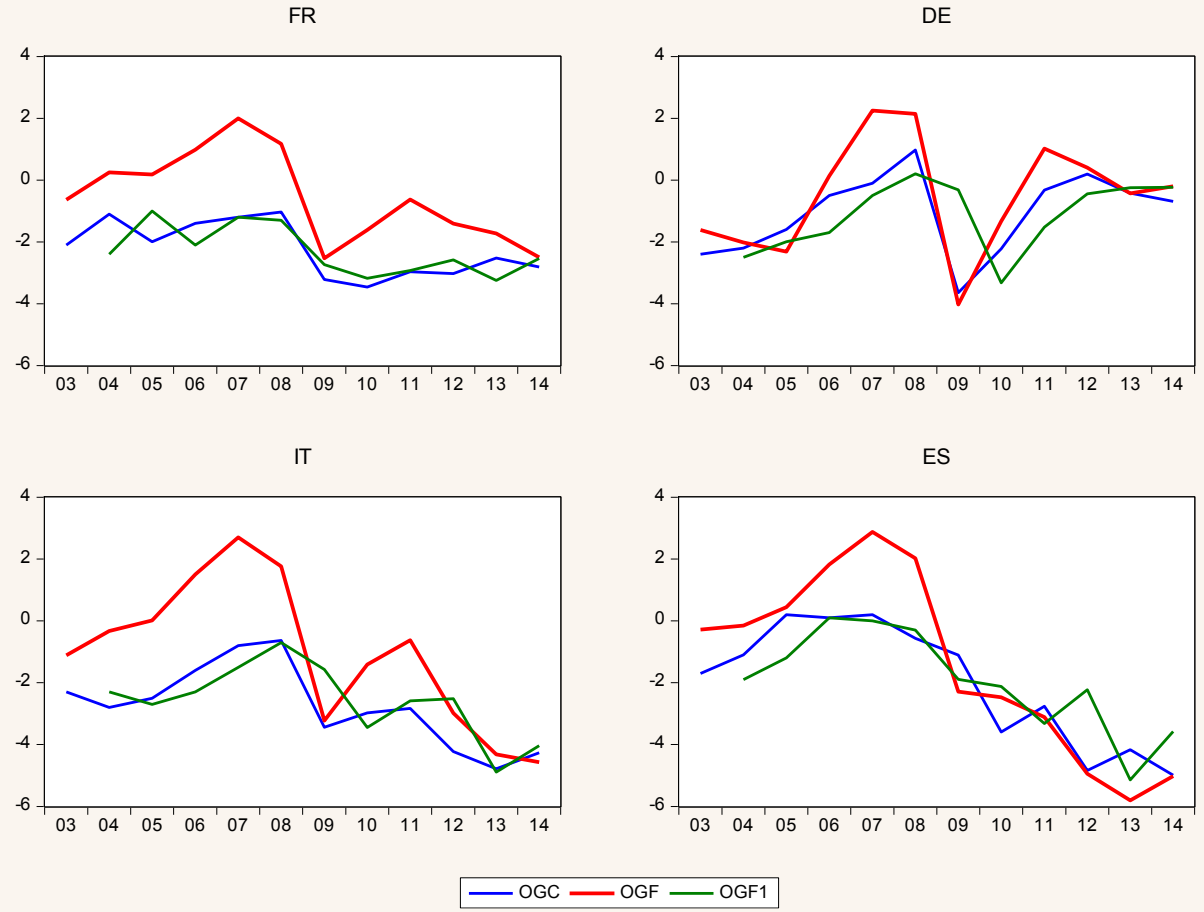
Questions

- Are budget balance (BB) forecasts systematically biased?
  - Budget balance is the difference between the government revenues and expenditures (including interest on the debt)
- How current economic conditions affect BB forecasts?
  - Does the sign of current BB matter?
- Are errors in budget balance forecasts due to
  - policy persistence?
  - nowcasted/forecasted macroeconomic conditions?
  - data revisions?
- What do real-time assessments of potential output reveal about errors in BB forecasting?

Real-time and revised real GDP growths

Source: IMF WEO autumn 2003-2015.

Real-time and revised output gaps

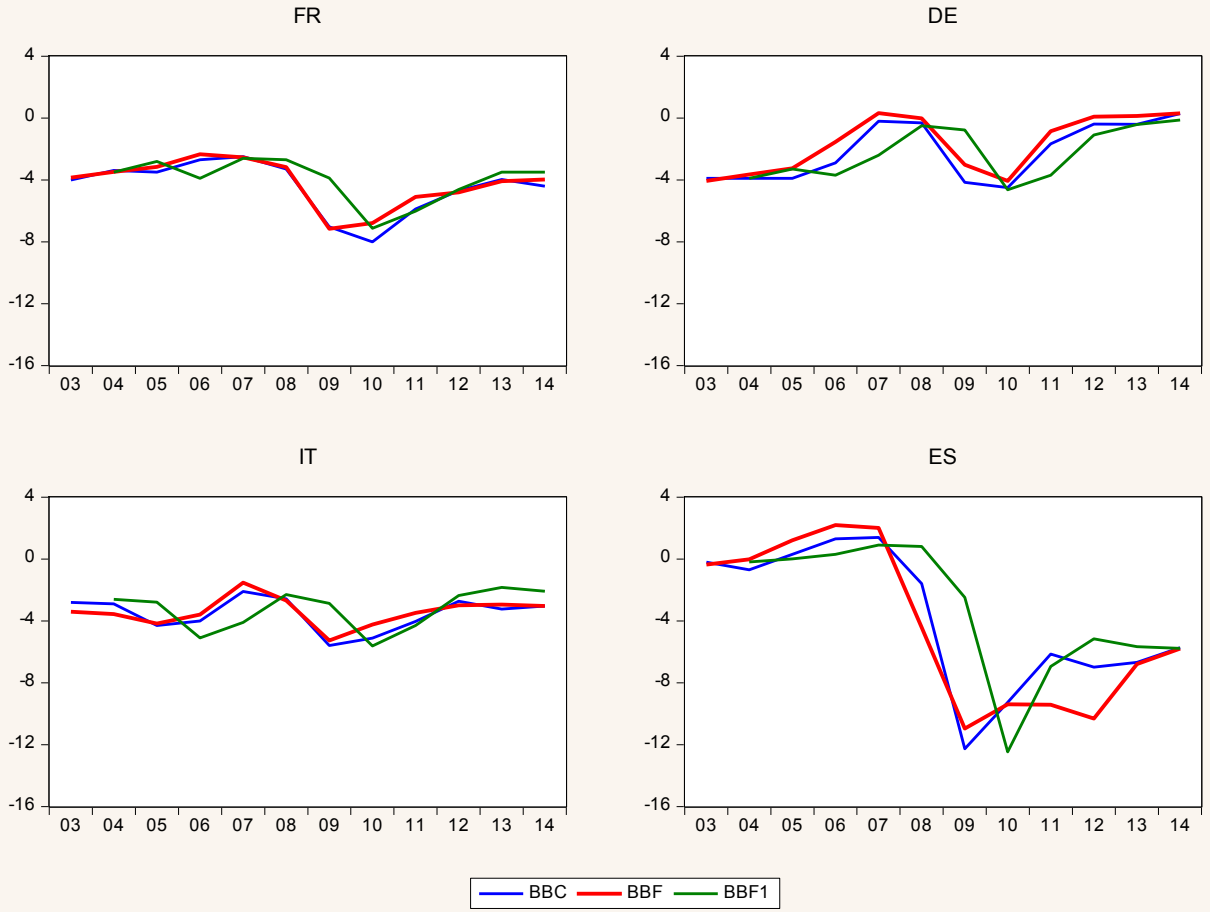


Source: IMF WEO autumn 2003-2015.

Real-time and revised potential output growths

Sources: IMF WEO autumn 2003-2015 and Bank of Finland calculations.

Real-time and revised budget balances



Source: IMF WEO autumn 2003-2015.

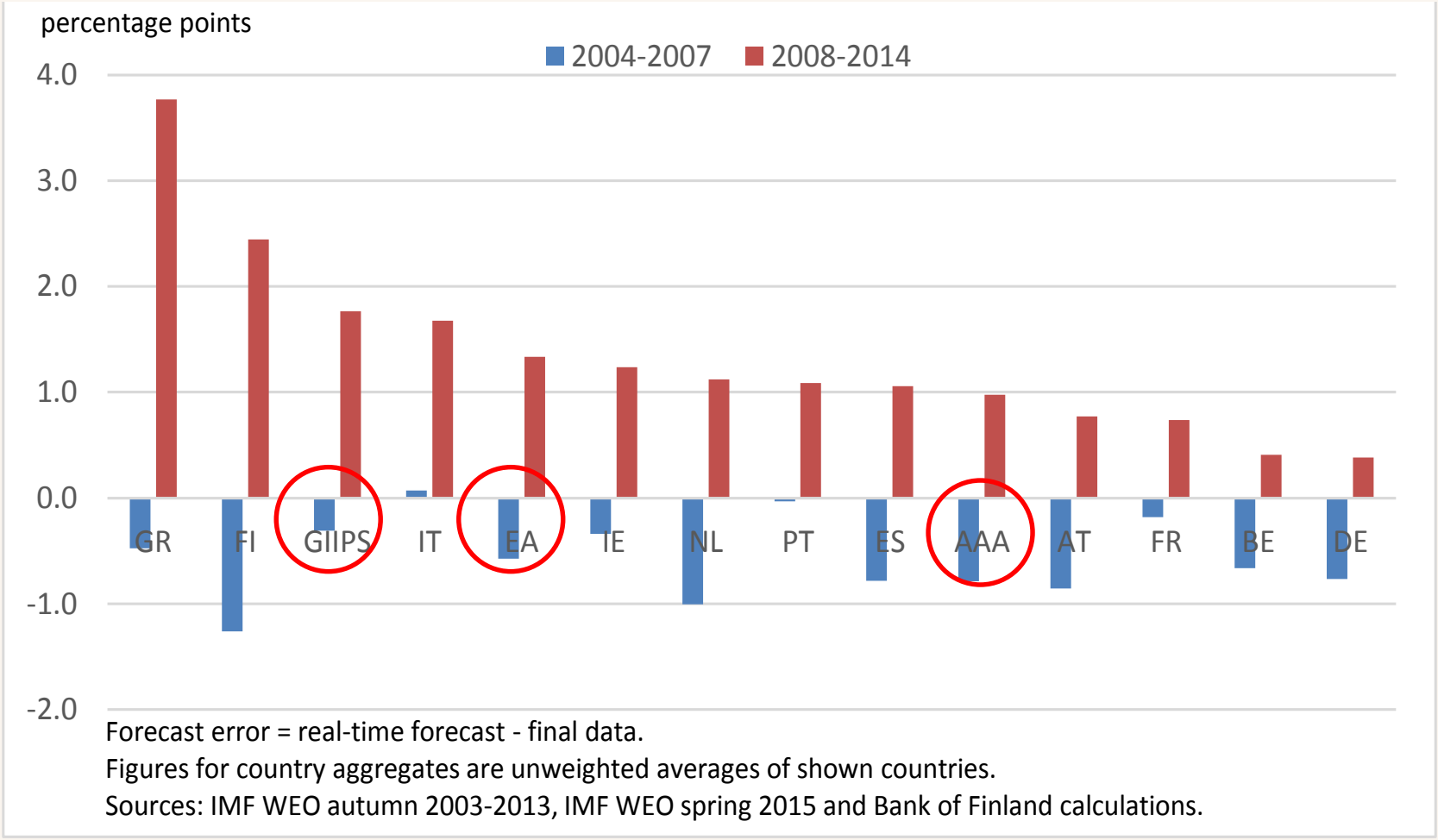
Are real-time BB forecasts systematically biased?

- Forecast error: the difference between BB forecasts (made in the previous autumn) and the corresponding revised information (WEO 2015)

- Full sample analysis
- Two subperiods (pre-crisis/after-crisis years)
- Two country groups (GIIPS/high-rated countries)

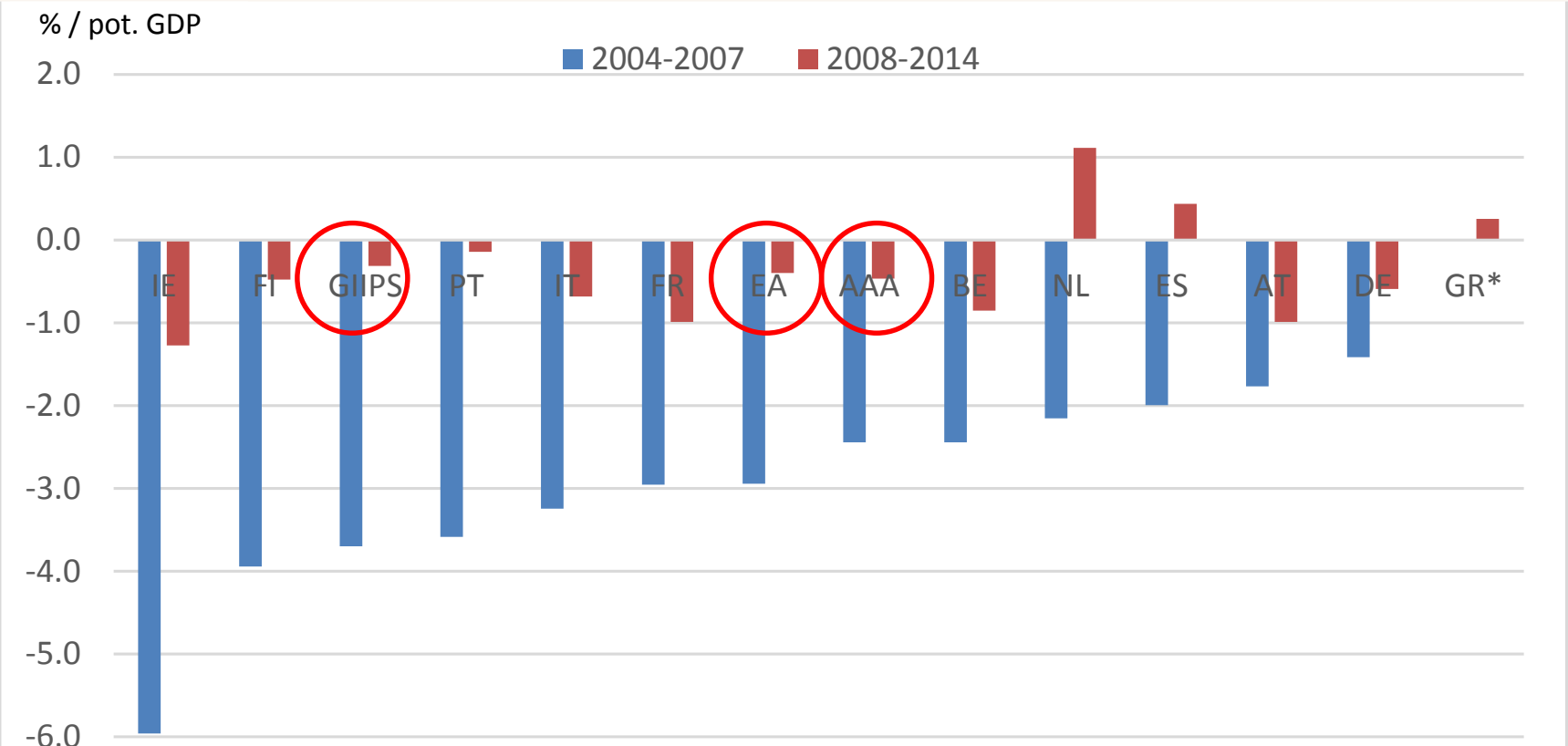
- T-test for means of forecast errors

Mean forecast errors for real GDP growth



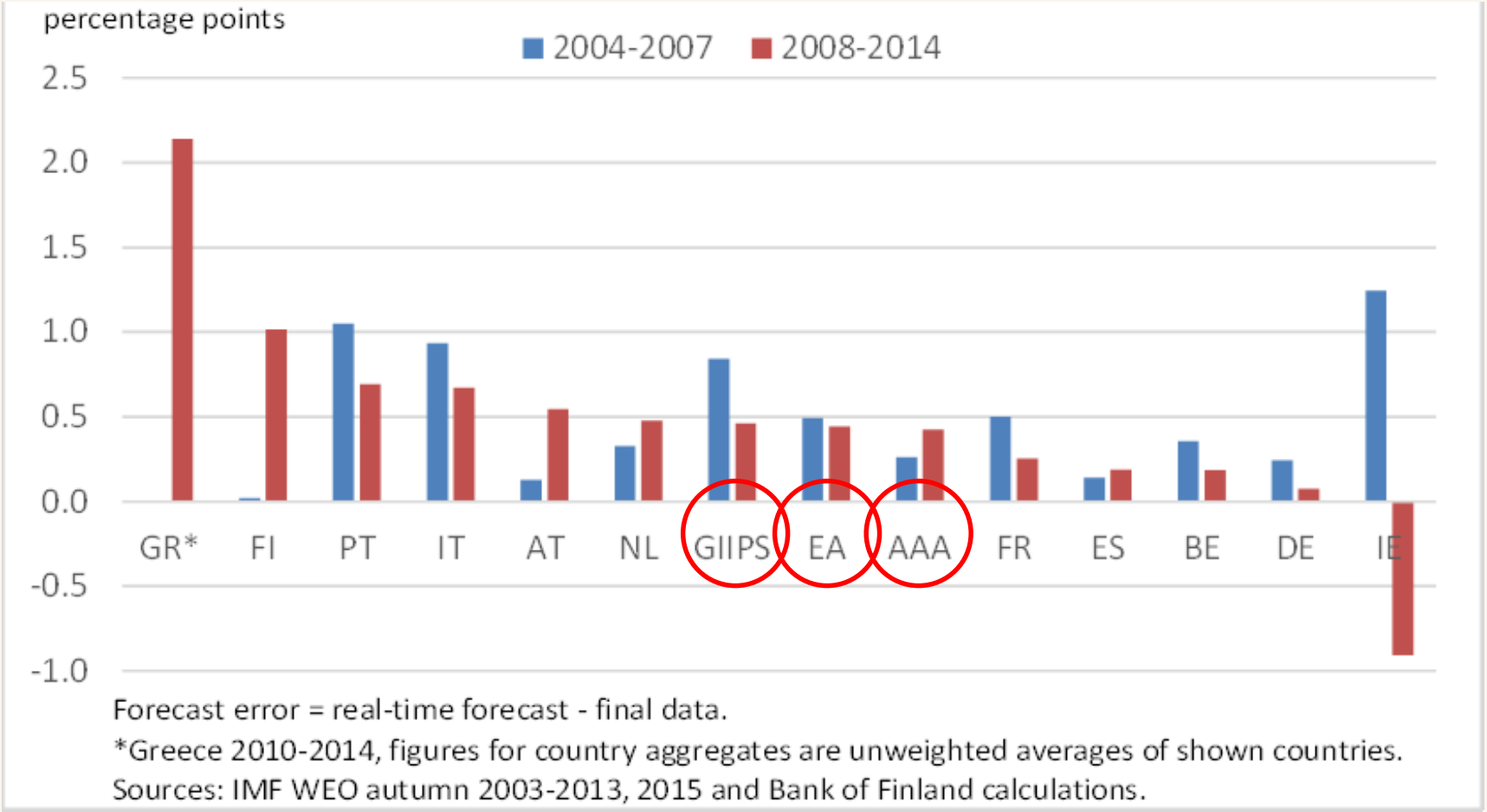
Forecast error = real-time forecast - final data.
Figures for country aggregates are unweighted averages of shown countries.
Sources: IMF WEO autumn 2003-2013, IMF WEO spring 2015 and Bank of Finland calculations.

Mean forecast errors for output gap



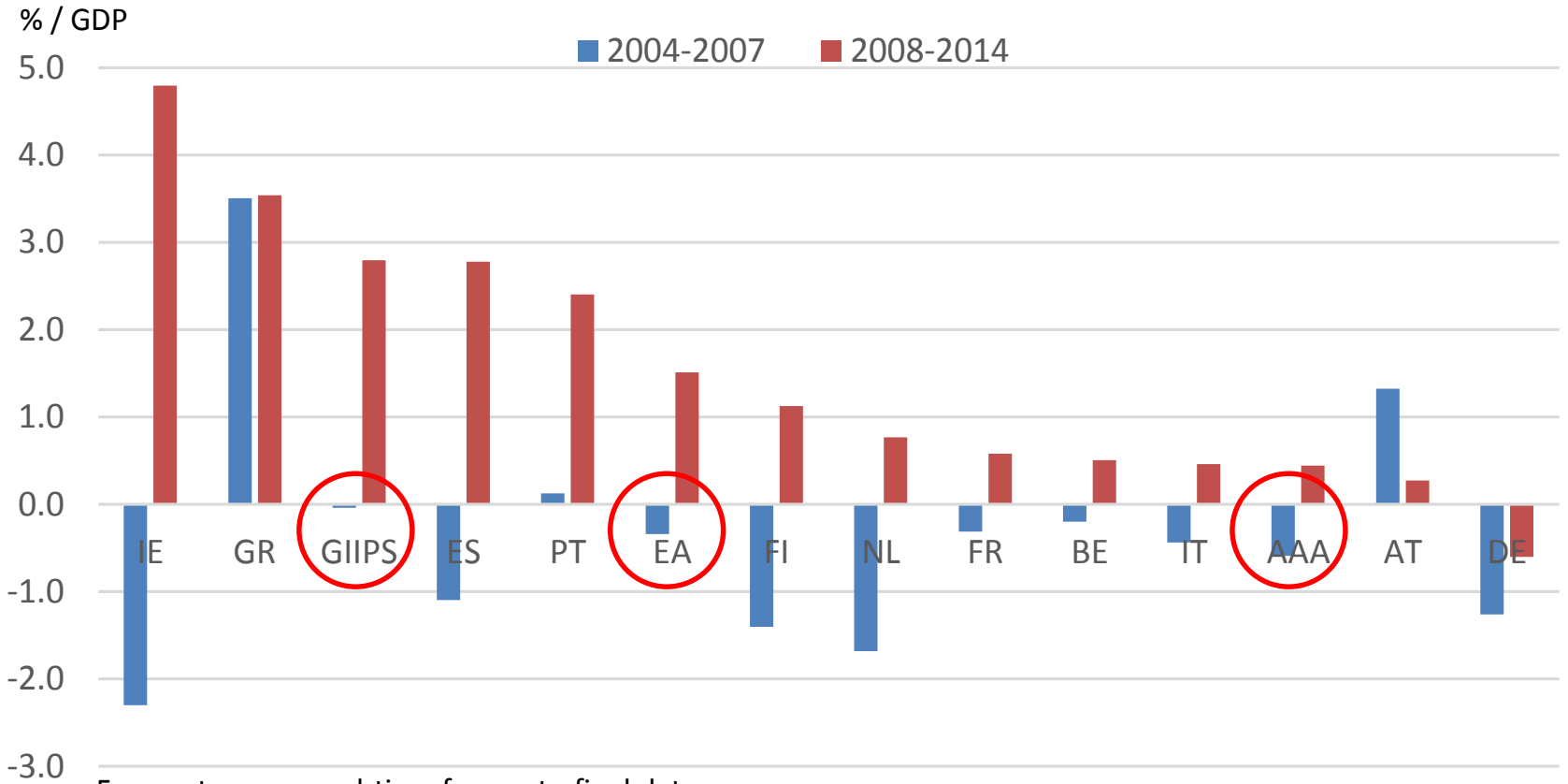
Forecast error = real-time forecast - final data.
*Greece 2010-2014, figures for country aggregates are unweighted averages of shown countries.
Sources: IMF WEO autumn 2003-2013, IMF WEO spring 2015 and Bank of Finland calculations.

Mean forecast errors for potential output growth



Forecast error = real-time forecast - final data.
*Greece 2010-2014, figures for country aggregates are unweighted averages of shown countries.
Sources: IMF WEO autumn 2003-2013, 2015 and Bank of Finland calculations.

Mean forecast errors for budget balance



Forecast error = real-time forecast - final data.
Figures for country aggregates are unweighted averages of shown countries.
Sources: IMF WEO autumn 2003-2013, IMF WEO spring 2015 and Bank of Finland calculations.

How real-time economic conditions affect budget planning?

- Forecasted BB change:

$$FDBB_t = BBF1_t - BBC_{t-1}$$

- Impact of nowcasted information on BB change:

$$FDBB_t = \alpha + \beta BBC_{t-1} + \lambda OGC_{t-1} + \varepsilon_t$$

- Separate coefficients for positive and negative BBs:

$$FDBB_t = \alpha + \beta_1 Surplus_{t-1} BBC_{t-1} + \beta_2 Deficit_{t-1} BBC_{t-1} + \lambda OGC_{t-1} + \varepsilon_t$$

- Actual BB change:

$$DBB_t = BBF_t - BBF_{t-1}$$

- Impact of actual information on BB change:

$$DBB_t = \alpha + \beta BBF_{t-1} + \lambda OGF_{t-1} + \varepsilon_t$$

- Alternative proxy for cyclical conditions: real GDP growth

Impact of economic conditions on BB change

Output gap specification

Sample:	FULL		PRECRISIS		AFTER-CRISIS		AAA		GIIPS	
Dep. Var:	DBB	FDBB	DBB	FDBB	DBB	FDBB	DBB	FDBB	DBB	FDBB
C	-1.010	-0.308	0.380	-0.047	-2.163	-0.351	-0.484	-0.035	-1.894	-0.602
	(0.357)***	(0.121)**	(0.274)	(0.130)	(0.534)***	(0.179)*	(0.294)	(0.127)	(0.786)**	(0.242)**
BBF(-1)	-0.235		-0.041		-0.339		-0.182		-0.312	
	(0.063)***		(0.079)		(0.080)***		(0.112)		(0.101)***	
OGF(-1)	-0.271		-0.094		-0.329		-0.175		-0.286	
	(0.085)***		(0.107)		(0.104)***		(0.126)		(0.130)**	
BBC(-1)		-0.142		-0.142		-0.138		-0.128		-0.157
		(0.030)***		(0.049)***		(0.039)***		(0.043)***		(0.043)***
OGC(-1)		-0.083		0.118		-0.123		0.090		-0.171
		(0.052)		(0.081)		(0.065)*		(0.075)		(0.073)**
Observations:	121	115	44	40	77	75	66	66	55	49
R-squared:	0.217	0.313	0.033	0.189	0.326	0.326	0.179	0.129	0.257	0.437

Note: ***, ** and * denote significance at the level of 1, 5 and 10 per cent, respectively.

Impact on economic conditions on BB change (pos./neg. current BB)

Output gap specification

Sample:	FULL		PRECRISIS		AFTER-CRISIS		AAA		GIIPS	
Dep. Var:	DBB	FDBB	DBB	FDBB	DBB	FDBB	DBB	FDBB	DBB	FDBB
C	-1.404	-0.387	0.113	-0.216	-2.319	-0.406	-0.812	-0.050	-2.638	-0.691
	(0.413)***	(0.141)***	(0.435)	(0.159)	(0.584)***	(0.206)*	(0.397)**	(0.167)	(0.927)***	(0.292)**
BBF(-1)*(BBF(-1)>=0)	0.393		0.196		0.020		0.082		1.150	
	(0.347)		(0.310)		(0.534)		(0.243)		(0.998)	
BBF(-1)*(BBF(-1)<0)	-0.289		-0.115		-0.357		-0.279		-0.386	
	(0.069)***		(0.122)		(0.085)***		(0.137)**		(0.112)***	
OGF(-1)	-0.313		-0.139		-0.346		-0.192		-0.327	
	(0.087)***		(0.122)		(0.107)***		(0.126)		(0.131)**	
BBC(-1)*(BBC(-1)>=0)		-0.020		0.075		-0.055		-0.115		0.133
		(0.115)		(0.133)		(0.158)		(0.102)		(0.530)
BBC(-1)*(BBC(-1)<0)		-0.158		-0.225		-0.147		-0.134		-0.166
		(0.033)***		(0.067)***		(0.042)***		(0.057)**		(0.047)***
OGC(-1)		-0.083		0.157		-0.124		0.091		-0.179
		(0.052)		(0.082)*		(0.065)*		(0.076)		(0.075)**
Observations:	121	115	44	40	77	75	66	66	55	49
R-squared:	0.239	0.321	0.048	0.252	0.330	0.328	0.198	0.129	0.287	0.440

Note: ***, ** and * denote significance at the level of 1, 5 and 10 per cent, respectively.

Errors in budget balance forecasts

- Defined as the difference between BB forecast and ex-post BB:

$$BBFE_t = BBF1_t - BBF_t$$

- Nowcasted errors:

$$BBCFE_t = BBC_t - BBF_t$$

$$OGCFE_t = OGC_t - OGF_t$$

Errors in budget balance forecasts

- Equation for errors in BB forecasts:

$$BBFE_t = a + bBBC_{t-1} + cBBCFE_{t-1} + dOGC_{t-1} + eOGCFE_{t-1} + \varepsilon_t$$

- Forward-looking specification:

$$BBFE_t = a + bBBC_{t-1} + cBBCFE_{t-1} + dOGF1_t + eOGFE_t + \varepsilon_t$$

- *Forecast error of the output gap* decomposed into two components:

$$BBFE_t = a + bBBC_{t-1} + cBBCFE_{t-1} + dOGF1_t + eGDPLEVFE_t + fPOTFE_t + \varepsilon_t$$

- Alternative proxy for cyclical conditions: real GDP growth

Errors in budget balance forecasts

Output gap specification

Sample: / Dep. Var:	FULL BBFE	PRECRISIS BBFE	AFTER-CRISIS BBFE	AAA BBFE	GIIPS BBFE
C	0.254	-0.853	1.191	0.776	-0.116
	(0.482)	(0.467)*	(0.656)*	(0.392)*	(1.295)
BBC(-1)	-0.007	0.082	0.055	0.099	-0.095
	(0.109)	(0.137)	(0.143)	(0.118)	(0.215)
BBCFE(-1)	0.537	0.647	0.409	0.828	0.337
	(0.148)***	(0.208)***	(0.189)**	(0.241)***	(0.255)
OGC(-1)	0.144	-0.275	0.199	0.345	0.057
	(0.165)	(0.245)	(0.200)	(0.183)*	(0.274)
OGCFE(-1)	-0.317	-0.014	-0.426	-0.064	-0.468
	(0.138)**	(0.181)	(0.171)**	(0.158)	(0.258)*
Observations:	115	40	75	66	49
R-squared:	0.207	0.350	0.239	0.298	0.196

Note: ***, ** and * denote significance at the level of 1, 5 and 10 per cent, respectively.

Errors in budget balance forecasts, forward-looking specification

Output gap specification

Sample:	FULL	PRECRISIS	AFTER-CRISIS	AAA	GIIPS
Dep. Var:	BBFE	BBFE	BBFE	BBFE	BBFE
C	1.079	-0.589	1.844	1.096	1.516
	(0.439)**	(0.531)	(0.600)***	(0.268)***	(1.295)
BBC(-1)	0.236	0.091	0.322	0.302	0.233
	(0.102)**	(0.134)	(0.134)**	(0.083)***	(0.209)
BBCFE(-1)	0.646	0.630	0.658	0.483	0.599
	(0.139)***	(0.213)***	(0.176)***	(0.201)**	(0.230)**
OGF1	-0.221	-0.238	-0.185	-0.152	-0.210
	(0.166)	(0.209)	(0.215)	(0.151)	(0.294)
OGFE	0.285	0.063	0.115	0.529	0.124
	(0.116)**	(0.146)	(0.178)	(0.088)***	(0.256)
Observations:	115	40	75	66	49
R-squared:	0.218	0.349	0.176	0.534	0.150

Note: ***, ** and * denote significance at the level of 1, 5 and 10 per cent, respectively.
Nowcasted economic conditions at the previous period and their revisions as instruments.

Errors in budget balance forecasts, decomposition of forecast error of the output gap

Sample: / *Dep. Var:*	FULL BBFE	PRECRISIS BBFE	AFTER-CRISIS BBFE	AAA BBFE	GIIPS BBFE
C	1.017 (0.433)**	-0.498 (0.574)	1.740 (0.630)***	1.020 (0.254)***	1.420 (1.303)
BBC(-1)	0.172 (0.107)	0.099 (0.137)	0.277 (0.159)*	0.241 (0.082)***	0.187 (0.229)
BBCFE(-1)	0.575 (0.143)***	0.598 (0.227)**	0.621 (0.190)***	0.421 (0.192)**	0.556 (0.246)**
OGF1	-0.174 (0.167)	-0.268 (0.222)	-0.152 (0.226)	-0.142 (0.144)	-0.177 (0.304)
GDPLEVFE	0.340 (0.119)***	0.104 (0.176)	0.158 (0.195)	0.571 (0.084)***	0.152 (0.265)
POTFE	-0.231 (0.119)*	-0.074 (0.152)	-0.108 (0.177)	-0.424 (0.090)***	-0.095 (0.263)
Observations:	115	40	75	66	49
R-squared:	0.240	0.352	0.179	0.588	0.155

Note: ***, ** and * denote significance at the level of 1, 5 and 10 per cent, respectively. Nowcasted output gap at the previous period used as an instrument for OGF1. Revisions for nowcasted real GDP level and potential output level at the previous period used as instruments for GDPLEVFE and POTFE.

Errors in budget balance forecasts

- *Expected potential output growth* and expected *real GDP growth* as measures of expected macroeconomic conditions :

$$BBFE_t = a + bBBC_{t-1} + cBBCFE_{t-1} + dPOTGF1_t + ePOTGFE_t + fGDPF1_t + gGDPFE_t + \varepsilon_t$$

Errors in budget balance forecasts

Sample:	FULL	PRECRISIS	AFTER-CRISIS	AAA	GIIPS
Dep. Var:	BBFE	BBFE	BBFE	BBFE	BBFE
C	0.668	0.575	0.835	0.033	2.434
	(0.635)	(1.002)	(0.904)	(0.662)	(1.391)*
BBC(-1)	0.074	0.142	0.119	0.031	0.286
	(0.093)	(0.146)	(0.132)	(0.084)	(0.199)
BBCFE(-1)	0.332	0.499	0.339	0.522	0.397
	(0.126)***	(0.230)**	(0.166)**	(0.164)***	(0.228)*
POTGF1	1.294	0.112	1.724	0.624	1.450
	(0.400)***	(0.663)	(0.591)***	(0.419)	(0.658)**
POTGFE	-1.541	0.133	-1.923	-0.428	-1.930
	(0.295)***	(0.433)	(0.376)***	(0.361)	(0.487)***
GDPF1	-1.211	-0.371	-1.386	-0.601	-1.494
	(0.293)***	(0.647)	(0.354)***	(0.271)**	(0.502)***
GDPFE	0.773	0.623	0.734	0.656	0.698
	(0.137)***	(0.325)*	(0.198)***	(0.099)***	(0.323)**
Observations:	115	40	75	66	49
R-squared:	0.486	0.413	0.487	0.693	0.464

Note: ***, ** and * denote significance at the level of 1, 5 and 10 per cent, respectively. Nowcasted potential output growth and real GDP growth at the previous period and their revisions used as instruments.

Errors in budget balance forecasts

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Conclusions

- Errors in forecasting are systematic
- Mean reversion is crucial element in budget balances
  - Only in the case of negative BB
  - Systematically stronger with revised information
- Revisions to current BB have contributed to errors in BB forecasts: errors in current BB are partly “inherited” by BB forecasts
- It is very challenging to decompose real GDP into potential output and the output gap
  - Forecasted macroeconomics conditions (potential output growth and real GDP growth) and their revisions have contributed errors in BB forecasts
- Strong institutions and fiscal discipline can ensure that enough room of manoeuvre and fiscal buffers are created in favourable economic conditions