Real-Time Macro Monitoring and Fiscal Policy

Florian Misch
Centre for European Economic Research

(with Eduardo Ley, The World Bank)

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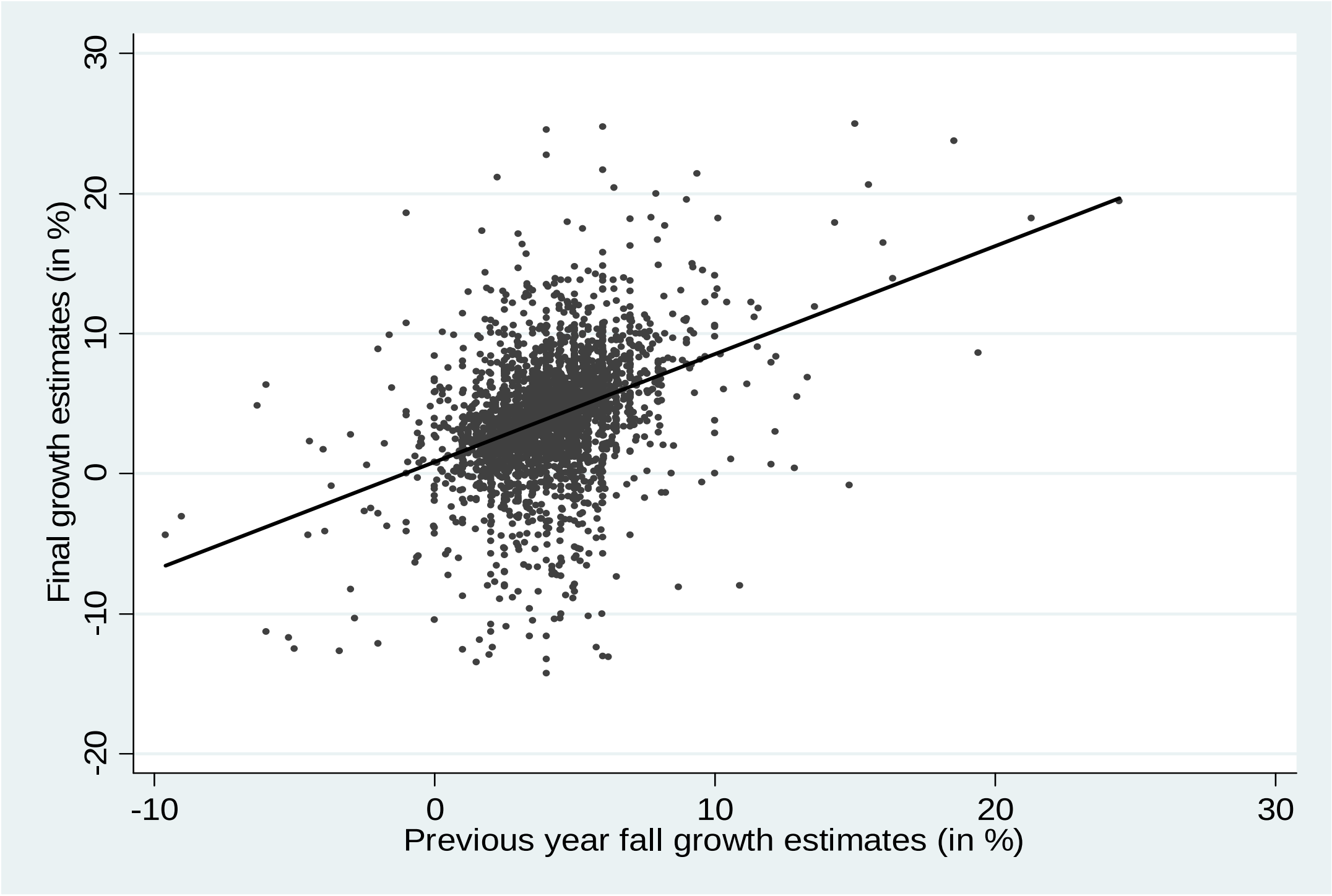
Motivation – GDP Revisions

- As newer and better information becomes available, GDP figures for a given year are revised

- Preliminary GDP figures available in real time conflict with final GDP figures

- Even sign of growth and output gaps may be misperceived in real time


Final growth estimates (in %)
30
20
10
0
-10
-20
-10
0
10
20
30
Previous year fall growth estimates (in %)

Motivation – Links to Fiscal Policy

- **Fiscal management** inevitably relies on potentially inaccurate real-time output data

  ➔ As a result revenue and expenditure projections are inaccurate

  ➔ Deficit targets are missed

  (fiscal policy is too tight, or unwanted debt accumulation occurs)

- **Fiscal surveillance** affected as structural balance estimates potentially inaccurate

- Ability to comply with **fiscal rules** may be undermined

Outline of the presentation

1) **Data:** Output data revisions across countries

2) **Analytical framework** to evaluate the effects of output data revisions in simple but comprehensive way

3) **Simulations of discrepancies between fiscal outcomes and fiscal projections** across countries as a result of output data revisions

4) **Policy implications**

Literature

- **Analysis of output gap / growth revisions**

  (Orphanides and van Norden 2002, REStat, for the U.S; González Cabanillas and Terzi 2012, Economic Papers; Giannone et al. (2012), REStat, for the Euro Area)

- **Analysis of implications of output gap / growth revisions for monetary policy**

  (Orphanides 2001, AER, for the U.S.; Neri and Ropele, 2011, EJ, for the Euro Area)

- **Analysis of nature and determinants of discrepanies between budgets and fiscal outcomes**

  (Beetsma et al. (2012), CEP; Castro et al. (2011); ECB WP; Frankel 2011, OREP)

- **Actual versus intentional fiscal policy stance** (countercyclical versus procyclical fp) (Cimadomo 2011, ECB WP)

1) Data

Data

- World Economic Outlook (WEO) data from 1966 to 2012 covering 175 countries

- … and from different release dates (spring and fall of each year between 1990 and 2012)

- …containing GDP data from each release date for each country

- For high-income countries, closely correlated with OECD and EU estimates; politically less biased than national sources

Data

- Final figures: latest vintage, at least 5 years later; typically from 2012 so that we discard 2008-2011 figures
- Preliminary figures: previous-year fall estimate which corresponds to information when budget is prepared
- For each year and country, we calculate difference between final and preliminary
  - Growth
  - Output gaps
  - Real output levels (in relative terms)

Data – Growth Revisions

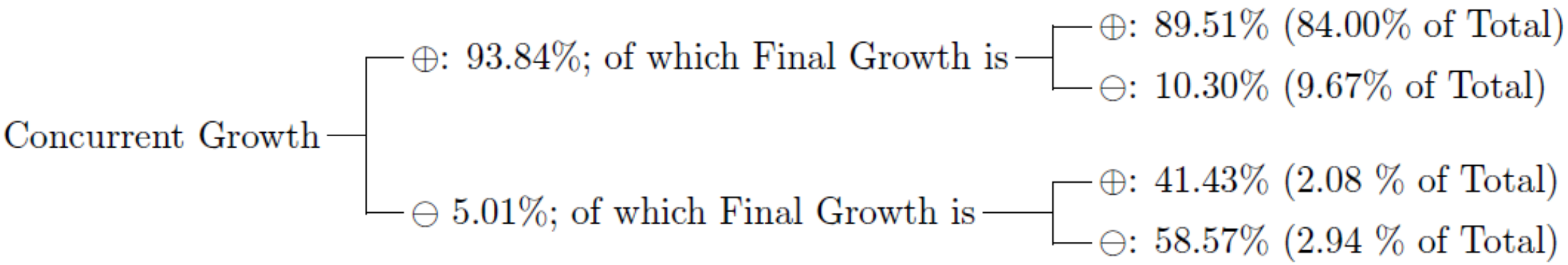
Table 1. Final growth rates and growth revisions

(169 countries: 1991-2007; $N = 2621$)

	Final growth rates (in %)					Revision to growth rates, in perc. points				
	Quartiles			Moments		Quartiles			Moments	
Country Group	25	50	75	Mean	StDev	25	50	75	Mean	StDev
High income: OECD	1.74	3.11	4.30	3.08	2.48	-0.97	0.10	1.18	0.01	2.18
High income: nonOECD	2.02	4.73	7.28	5.13	5.05	-1.62	0.72	2.70	0.85	4.44
Upper middle income	1.43	4.08	6.40	3.67	4.52	-2.36	0.24	2.49	-0.14	4.37
Lower middle income	2.24	4.41	6.60	4.45	4.52	-1.83	0.06	1.78	-0.04	4.09
Low income	1.67	4.37	6.46	3.77	5.32	-3.04	-0.60	1.25	-1.15	5.19
All countries	1.85	4.00	6.21	3.95	4.50	-1.86	0.05	1.79	-0.19	4.21

Source: WEO data and own compilation

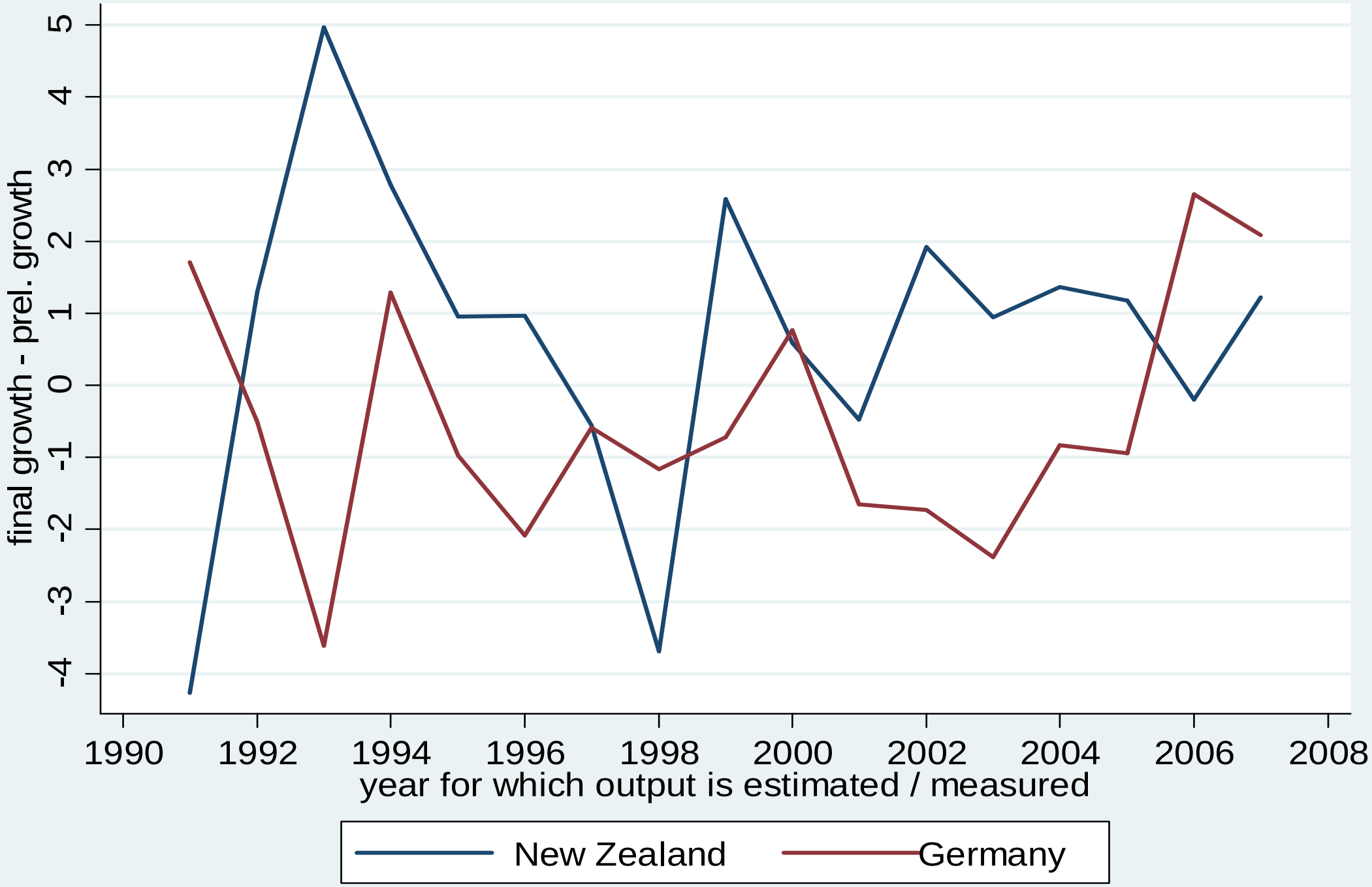
Note: outliers omitted; preliminary figure = previous year fall estimate


Concurrent Growth
⊕: 93.84%; of which Final Growth is
⊕: 89.51% (84.00% of Total)
⊖: 10.30% (9.67% of Total)
⊖ 5.01%; of which Final Growth is
⊕: 41.43% (2.08 % of Total)
⊖: 58.57% (2.94 % of Total)

Determinants of Revisions (Regression Analysis)

Projections more accurate in absolute terms if

- Level of development higher and quality of statistical management better
- Probability of exogenous shocks lower (commodity exporters, conflicts, disasters, wars)
- Estimations made outside cyclical turning points
- Estimations made in years prior to great recession
- Estimations made in larger countries


final growth - prel. growth
-4
-3
-2
-1
0
1
2
3
4
5
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
year for which output is estimated / measured
New Zealand
Germany

2) Modeling Framework

Modeling Framework (1)

- **Intuition:**
  - Absence of discretionary fiscal changes
  - *Actual revenue and expenditure outcomes* as a result of actual growth
  - S*tylized projections of revenue and expenditure* based on growth projections

Modeling Framework (2)

- **Building blocks:**
  - Actual change in the balance: $\Delta b = \Delta r - \Delta e = (\rho\, r_{-1} - \epsilon\, e_{-1})\gamma$
  - Projected change in the balance: $\Delta \hat{b} = \Delta \hat{r} - \Delta \hat{e} = (\rho\, r_{-1} - \epsilon\, e_{-1})\hat{\gamma}$
  - $r_{-1}, e_{-1}, \rho, \epsilon$ denote revenue & expenditure in *t-1* and their elasticities; all known with uncertainty; actual output growth, level and gaps: γ_t, y_t, z_t

Modeling Framework (3)

- **Output data revisions affect these deviations in three ways:**
  - Changes in automatic response of fiscal aggregates to growth
  - Denominator changes (budget balances measured in % of GDP)
  - Output gap revisions affect structural balance

Modeling Framework (4)

- Difference between actual balance and projected balance, in terms of GDP

$$\frac{b_t(\gamma_t)}{y_t} - \frac{\hat{b}_t(\hat{\gamma}_t)}{\hat{y}_t}$$

Modeling Framework (4)

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$$\frac{b_t(\gamma_t)}{y_t} - \frac{\hat{b}_t(\hat{\gamma}_t)}{\hat{y}_t}$$

Modeling Framework (4)

- Difference between actual balance and projected balance, in terms of GDP

$$\frac{b_t(\gamma_t)}{y_t} - \frac{\hat{b}_t(\hat{\gamma}_t)}{\hat{y}_t}$$

- With a bit of algebra, this is

$$\left(\frac{b_t}{y_t} - \frac{\hat{b}_t}{\hat{y}_t}\right) = \frac{\gamma_t - \hat{\gamma}_t - \hat{\gamma}_t\phi_t}{1+\gamma_t} \cdot \left(\rho\frac{r_{t-1}}{y_{t-1}} - \epsilon\frac{e_{t-1}}{y_{t-1}}\right) - \frac{\phi_t}{1+\gamma_t} \cdot \frac{b_{t-1}}{y_{t-1}}$$

- Calculation of difference between actual and projected structural balance feasible along the same lines

Modeling Framework – Take Aways

- Difference between actual and estimated budget balance in % of GDP driven by
  - Actual growth
  - Projected growth
  - Error in estimated of level of GDP (in relative terms)
  - Revenue and expenditure elasticities
  - Revenue and expenditure levels

3) Simulation

Simulation (1)

- Output growth, output level and output gap revisions come from WEO dataset
- For remaining parameters, exact values for each country-year combination difficult to obtain
- We therefore set lower and upper bounds based on estimates in the literature *by country income group*
- We assume a uniform / triangular distribution and draw 1,000 times

	r/y		b/y		ρ		$\lvert\epsilon\rvert$	
Country Group	min	max	min	max	min	max	min	max
High income: OECD	0.25	0.55	-0.10	0.05	0.90	1.20	0.02	0.30
High income: non-OECD	0.20	0.50	-0.10	0.05	0.80	1.10	0.01	0.25
Upper middle income	0.15	0.40	-0.10	0.05	0.70	1.00	0.05	0.10
Lower middle income	0.10	0.30	-0.10	0.05	0.60	0.90	0.00	0.05
Low income	0.10	0.20	-0.10	0.05	0.60	0.80	0.00	0.00
All countries	0.10	0.55	-0.10	0.05	0.60	1.20	0.00	0.30

Table 4. Revisions of the overall balance, % of GDP

(169 countries: 1991-2007; $N = 2621000$)

	Percentiles					Moments	
Country Group	10	25	50	75	90	Mean	StDev
High income: OECD	-1.18	-0.48	0.07	0.61	1.18	0.01	1.20
High income: nonOECD	-1.84	-0.69	0.21	1.05	2.25	0.16	2.24
Upper middle income	-1.57	-0.61	0.05	0.69	1.37	-0.04	1.42
Lower middle income	-0.96	-0.36	0.02	0.39	1.03	0.08	1.36
Low income	-1.17	-0.48	-0.06	0.26	0.75	-0.16	0.92
All countries	-1.26	-0.48	0.02	0.52	1.20	-0.00	1.39

Source: WEO data and own compilation

Table 5. Revisions of the structural balance, % of GDP

(169 countries: 1991-2007; $N = 2621000$)

	Percentiles					Moments	
Country Group	10	25	50	75	90	Mean	StDev
High income: OECD	-1.22	-0.58	-0.04	0.49	1.04	-0.07	1.02
High income: nonOECD	-1.53	-0.63	0.21	1.08	2.28	0.30	2.06
Upper middle income	-1.47	-0.65	-0.02	0.59	1.27	-0.07	1.25
Lower middle income	-0.89	-0.38	-0.03	0.37	1.00	0.06	1.33
Low income	-1.10	-0.51	-0.09	0.22	0.70	-0.18	0.86
All countries	-1.20	-0.52	-0.03	0.46	1.14	-0.02	1.28

Source: WEO data and own compilation

4) Policy Implications

Policy Implications

- Real-time fiscal surveillance challenging
- Safety margins may be required for budgetary planning
- What are the effects of repeated fiscal policy mistakes on debt accumulation?

Table 6. Debt accumulation over 10 years, in % of the 10th period's GDP

(169 countries: 1991-2007; $N = 50000$)

	Percentiles					Moments	
Country Group	10	25	50	75	90	Mean	StDev
High income: OECD	-3.96	-2.18	-0.26	1.63	3.78	-0.13	3.17
High income: nonOECD	-8.52	-5.27	-2.49	0.44	2.90	-2.66	4.60
Upper middle income	-3.88	-1.97	-0.06	2.03	4.42	0.16	3.26
Lower middle income	-1.98	-0.93	0.18	1.21	2.23	0.13	1.73
Low income	-0.94	-0.07	0.88	1.90	2.98	0.97	1.57
All countries	-4.26	-1.88	-0.01	1.54	3.17	-0.31	3.31

Source: WEO data and own compilation

Policy Implications

- Real-time fiscal surveillance challenging
- Safety margins may be required for budgetary planning
- What are the effects of repeated fiscal policy mistakes on debt accumulation?
- Vulnerability of fiscal rules to output data revisions differs

Policy Implications for Fiscal Rules (1)

- Framework easily extendable to evaluate whether and to what extent targets specified by various fiscal rules are missed

- In essence, such an exercise evaluates extent of non-compliance of ‘benevolent’ governments with fiscal rules

- Comparisons complicated by differences in the effectiveness of fiscal rules to contain debt even in the absence of output projection errors

Policy Implications for Fiscal Rules (2)

- Structural fiscal rules desirable in many ways
- Expenditure rules less vulnerable to output data revisions
- In 31% of the cases, debt accumulation higher than permitted in high income countries compared to 51% in the case of structural fiscal rules
- Credibility of SFRs low relative to expenditure rules

Summary

- We simulate the effects of output data revisions on the deficit and other fiscal aggregates using a novel dataset

- Our results are only driven by ability of governments, not willingness, to make correct estimates of budget balances

- Careful to not overestimate the effects and robustness checks (not shown)

- Mean fiscal revisions are small, but probability of large effects still relatively high

Caveats

- Model expenditure and revenue forecasting in more sophisticated way

  (so far, model highly stylized and reflects realities in dev. countries)

- Make framework more relevant for policy debates in EU (e.g., on conditional compliance, etc.)

- WEO data may not be relevant for fiscal policy decisions in high income-countries

- WEO forecasts politically biased?

Appendix: Structural Balance (1)

- Cyclical balance

$$b_t^c(z_t) = z_t \cdot [\rho\, r_t(\gamma_t) - \epsilon\, e_t(\gamma_t)]$$

- Deviation of actual structural balance from projected

$$\left(\frac{b_t^s}{y_t} - \frac{\hat{b}_t^s}{\hat{y}_t}\right) = \left(\frac{b_t}{y_t} - \frac{\hat{b}_t}{\hat{y}_t}\right) - \left(\frac{b_t^c}{y_t} - \frac{\hat{b}_t^c}{\hat{y}_t}\right)$$

- As cyclical balance function of output gap, gap revisions matter as well

Appendix: Unplanned debt accumulation (2)

- Unplanned debt accumulation

$$\frac{\Delta D_{t_0+n}}{y_{t_0+n}} = \frac{1}{y_{t_0+n}} \sum_{s=1}^{n} (\hat{b}_{t_0+s} - b_{t_0+s})$$

Table 8. The Determinants of Growth Revisions in Absolute Terms

VARIABLES	(1) abs. revision	(2) abs. revision	(3) abs. revision	(4) abs. revision	(5) abs. revision
tphp	0.326***	0.408***	0.415***	0.329***	0.999***
volatile	0.243***	0.357***	0.310***	0.186***	0.354***
resources	-0.0139	0.115	-0.0478	-0.0487	-0.485
conflict	0.600***	1.495***	0.780	0.228	0.976
disaster	0.527***	0.927***	0.527**	0.286	0.408
gdds	-0.187***	-0.181	-0.209*	-0.193**	-0.673**
sdds	-0.395***	-0.198	-0.470***	-0.536***	
population	-0.160***	-0.139***	-0.188***	-0.173***	-0.221
imf	0.0327	0.0751	0.131	-0.239**	-0.352
imf5	-0.270***	-0.117	-0.134	-0.403***	-0.584**
recession	0.650***	2.307***	0.699**	0.243	0.512
lic	0.292***	0.446**	0.318**	0.471***	
p1990	0.315***	0.372***	0.260**	0.235**	0.229
Constant	1.943***	1.027***	1.079***	1.018***	1.547***
Observations	17,816	3,964	3,964	3,630	804
R-squared	0.166	0.173	0.153	0.113	0.159

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

(1) All vintages included with vintage fixed effects

(2) Forecasts only

(3) Nowcasts only

(4) t+1 Backcasts only

(5) Nowcasts & LICs only