Common Fluctuations in OECD Budget Balances

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Slides available at
http://pages.slu.edu/faculty/rapachde/Research.htm

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- The views expressed in this paper are those of the authors and do not reflect those of the Federal Reserve Bank of St. Louis or the Federal Reserve System

Introduction

- Fiscal issues back on front burner (Calmes, 2009, *NYT*)
  - Prospect of vast U.S. budget deficits
  - 12.3% of GDP in 2009
- Governments blamed/credited for fiscal balances
  - Leonhardt (2009, *NYT*) blames current/past presidents
- Economic circumstances important for fiscal policy
  - Welfare implications
  - Sustainability
- International circumstances
  - ↑ economic/financial interdependence
  - Neely (2003)

Introduction

- Latent world factor underlying national budget surpluses
  - 18 OECD countries, 1980–2008
  - Estimate dynamic latent factor model
- Other approaches
  - Weighted average of national surpluses
    - Dominated by few large countries
  - Pair-wise correlations
    - Difficult to summarize
    - Not a unified framework
- Nearly predetermined national variables
  - Output gaps
  - Dividend-price ratios
  - Unexpected inflation
  - Military spending

Dynamic latent factor model

- $$\underbrace{y_{i,t}}_{\text{demeaned surplus}} = \underbrace{\beta_i}_{\text{loading}} \times \underbrace{f_t}_{\text{world factor}} + \underbrace{\epsilon_{i,t}}_{\text{country factor}}$$
- $i = 1, \ldots, N; \quad t = 1, \ldots, T$
- World factor, f_t
  - Common across all N countries
  - Captures source of global comovments
- Country (idiosyncratic) factor, $\epsilon_{i,t}$
  - Captures non-global fluctuations
- f_t, $\epsilon_{i,t}$ follow AR processes $\Rightarrow$ dynamic latent factor model
- Standard assumption: $f_t \perp \epsilon_{i,t}$

Dynamic latent factor model

- Normalize to identify signs/scales of factor/loadings
  - $\beta_{Canada} > 0$
  - $\sigma_f^2 = 1$
  - No economic content here
- Comovements in $y_{i,t}$s due solely to f_t
  - Extreme I: $\beta_i = 0$, $\sigma_i^2 > 0 \; \forall i \Rightarrow y_{i,t} = \epsilon_{i,t} \; \forall i$
  - Extreme II: $\sigma_i^2 = 0$, $\beta_i > 0 \; \forall i \Rightarrow y_{i,t} = \beta_i f_t \; \forall i$
  - Patterns in data likely to fall between extremes
- Dynamic latent factor model $\Rightarrow$ variance decomposition
  - $\theta_i^{world} = \beta_i^2 \text{var}(f_t)/\text{var}(y_{i,t})$
  - $\theta_i^{country} = \text{var}(\epsilon_{i,t})/\text{var}(y_{i,t})$
  - $\text{var}(y_{i,t}) = \beta_i^2 \text{var}(f_t) + \text{var}(\epsilon_{i,t})$

Dynamic latent factor model

- Could include additional factors
  - E.g., regions, exchange rate systems, trading blocs
  - Orthogonal factors $\Rightarrow f_t$, β_i, θ_i^{world} unaffected
- Latent factor model
  - Can't use conventional regression methods
  - Bayesian MCMC estimation (Otrok and Whiteman, 1998)
  - Principal component estimates produce similar results
- Diffuse conjugate priors
- Assume $f_t, \epsilon_{i,t} \sim I(0) \Rightarrow y_{i,t} \sim I(0)$
  - Intertemporal gov. budget constraint $\Rightarrow I(0)$ budget surplus

Data

- Sample: 1980–2008
- 4 OECD measures of country's fiscal position
  - Net lending, % of GDP
  - Cyclically adjusted net lending, % of potential GDP
  - Primary balance, % of GDP (excludes interest on debt)
  - Cyclically adjusted primary balance, % of potential GDP
- Output gap (OECD)
- Dividend-price ratio (GFD)
  - Strong correlation with capital gains tax receipts
- Unexpected inflation
  - π_t computed from CPI (OECD)
  - $\Delta\pi_t$ (Atkeson and Ohanian, 2001)
- Military spending, % of GDP (WMEAT)
  - Available through 2005

Summary stats., net lending (% of GDP)

Group	Mean	SD	Min.	Max.
Canada	−3.32	3.98	−9.13	2.94
United Kingdom	−2.88	2.49	−7.98	3.67
United States	−3.28	2.00	−5.77	1.62
Austria	−2.79	1.43	−5.88	−0.15
Belgium	−5.38	4.81	−15.96	0.40
Denmark	−0.83	3.94	−10.80	5.06
Finland	1.79	4.14	−8.27	6.94
France	−3.00	1.30	−6.42	−0.11
Greece	−7.09	3.15	−14.04	−2.34
Iceland	−0.51	3.02	−4.69	6.32
Ireland	−3.37	5.36	−13.29	4.72
Italy	−7.17	4.01	−12.38	−0.86
Netherlands	−2.89	2.59	−9.22	1.97
Norway	7.05	5.92	−1.85	20.01
Spain	−3.21	2.74	−7.32	2.22
Sweden	−1.40	4.37	−11.17	3.75
Australia	−1.51	2.64	−5.47	2.05
Japan	−3.52	3.36	−11.16	2.05
Average	−2.42	3.40	−8.93	3.35

Summary stats., CA net lending (% of pot. GDP)

Group	Mean	SD	Min.	Max.
Canada	−2.99	3.49	−8.54	2.11
United Kingdom	−2.84	1.97	−7.02	1.01
United States	−3.11	1.80	−5.31	0.89
Austria	−2.47	1.17	−5.30	−0.84
Belgium	−4.99	4.34	−15.66	0.30
Denmark	−0.70	3.22	−9.03	5.40
Finland	2.36	2.57	−3.14	6.11
France	−2.91	1.22	−5.94	−0.81
Greece	−7.08	3.16	−14.15	−2.42
Iceland	−0.59	2.48	−4.44	5.15
Ireland	−3.33	5.15	−14.13	3.09
Italy	−6.81	4.12	−12.32	−0.55
Netherlands	−2.59	2.17	−8.04	1.15
Norway	−1.00	2.28	−5.96	3.29
Spain	−2.63	2.39	−6.76	2.01
Sweden	−1.31	3.33	−7.64	3.16
Australia	−1.36	2.39	−4.97	1.98
Japan	−3.45	3.11	−10.85	1.13
Average	−2.65	2.80	−8.29	1.79

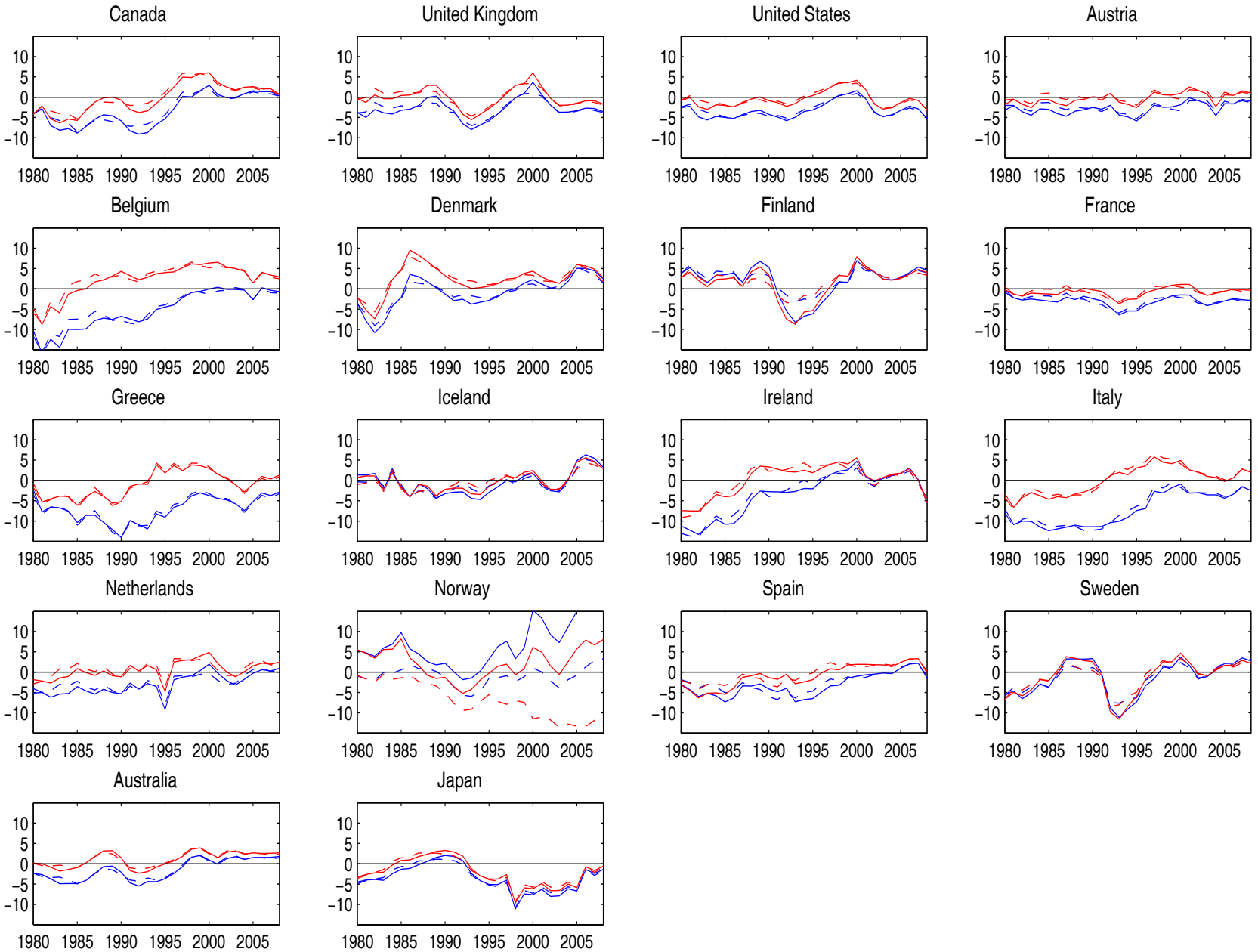
Summary stats., primary balance (% of GDP)

Group	Mean	SD	Min.	Max.
Canada	−0.13	3.64	−6.37	6.01
United Kingdom	−0.19	2.51	−5.56	6.00
United States	−0.55	2.04	−3.20	4.14
Austria	−0.25	1.36	−2.58	2.55
Belgium	2.17	3.88	−8.79	6.55
Denmark	2.37	3.67	−7.37	9.53
Finland	1.47	4.02	−8.72	7.91
France	−0.77	1.11	−3.71	1.10
Greece	−0.94	3.18	−6.15	3.82
Iceland	−0.18	2.61	−4.03	5.62
Ireland	0.08	3.96	−7.53	5.58
Italy	−0.02	3.41	−6.67	5.79
Netherlands	0.53	2.16	−4.78	4.87
Norway	2.28	3.82	−5.24	8.15
Spain	−0.90	2.79	−6.31	3.33
Sweden	−1.06	4.39	−11.60	4.70
Australia	1.08	1.93	−2.34	3.91
Japan	−2.12	3.42	−9.70	3.31
Average	0.16	2.99	−6.15	5.16

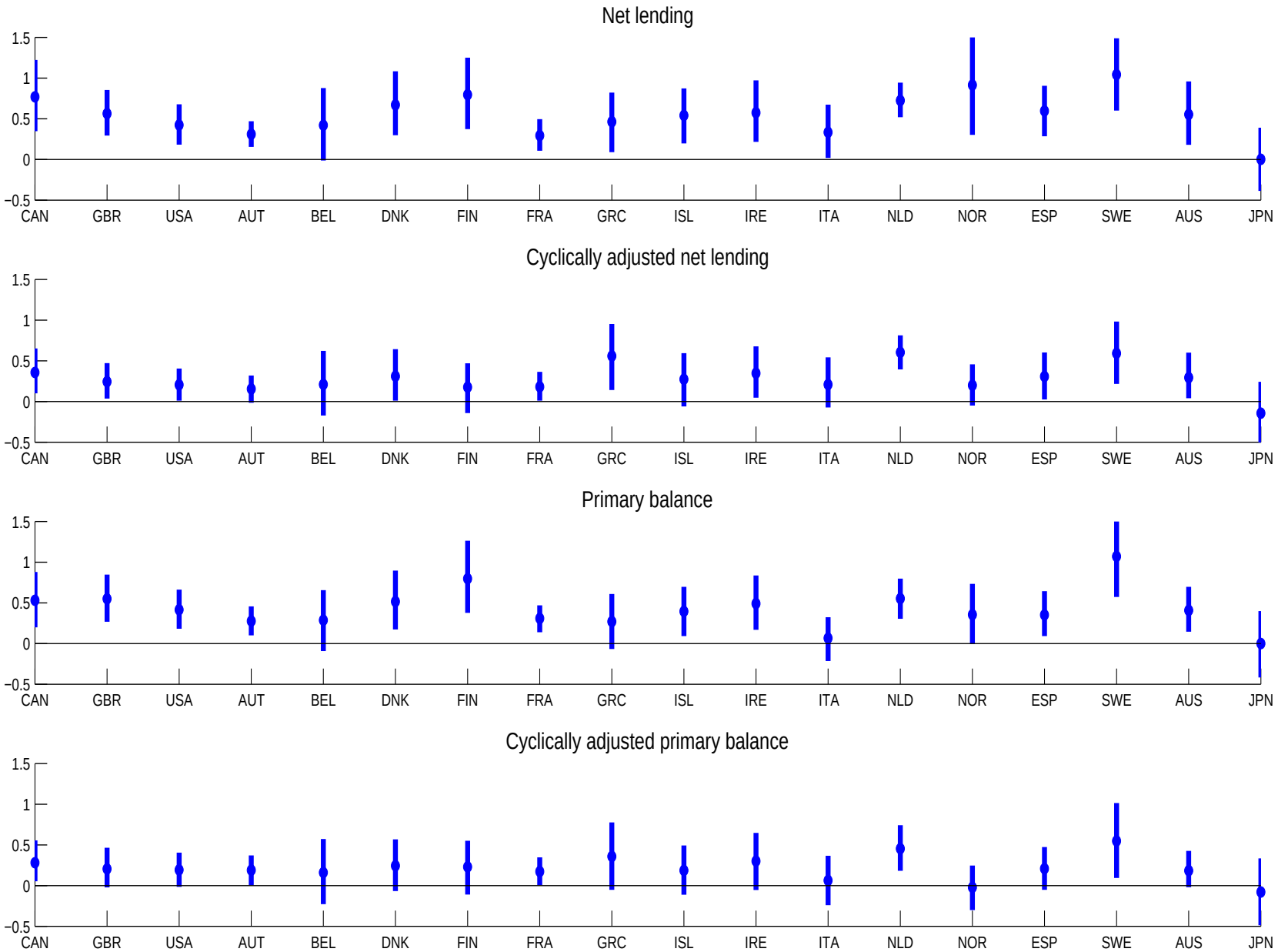
Summary stats., CA primary balance (% of pot. GDP)

Group	Mean	SD	Min.	Max.
Canada	0.17	3.26	−5.41	5.92
United Kingdom	−0.16	2.15	−4.65	3.36
United States	−0.40	1.87	−3.05	3.51
Austria	0.05	1.10	−1.96	1.84
Belgium	2.52	3.57	−8.46	6.61
Denmark	2.49	3.01	−5.68	8.03
Finland	2.04	2.51	−3.55	7.10
France	−0.68	1.02	−3.27	0.90
Greece	−0.96	3.42	−6.72	4.29
Iceland	−0.27	2.20	−4.22	4.42
Ireland	0.09	4.05	−9.16	4.32
Italy	0.29	3.64	−7.14	6.81
Netherlands	0.80	1.89	−3.68	3.33
Norway	−7.04	4.55	−13.57	−0.50
Spain	−0.35	2.30	−4.21	3.23
Sweden	−0.96	3.40	−8.43	3.36
Australia	1.22	1.63	−1.28	3.85
Japan	−2.06	3.22	−9.41	2.67
Average	−0.18	2.71	−5.77	4.06

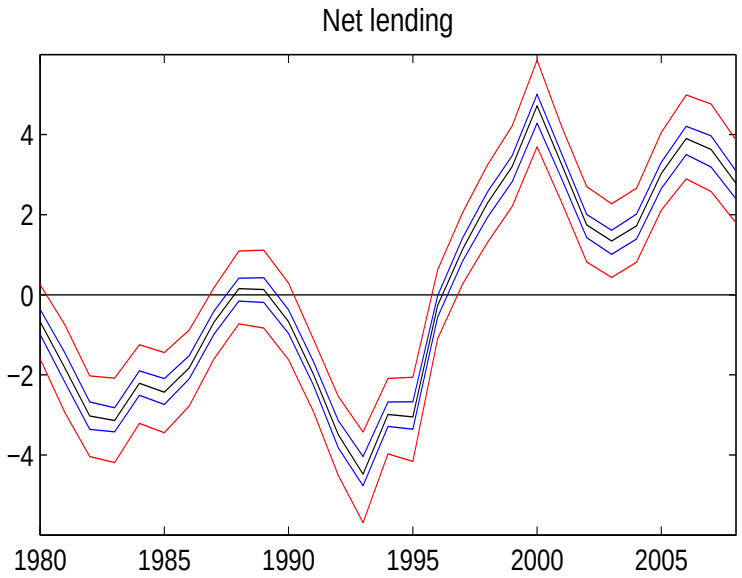
Annual budget surpluses, 1980–2008

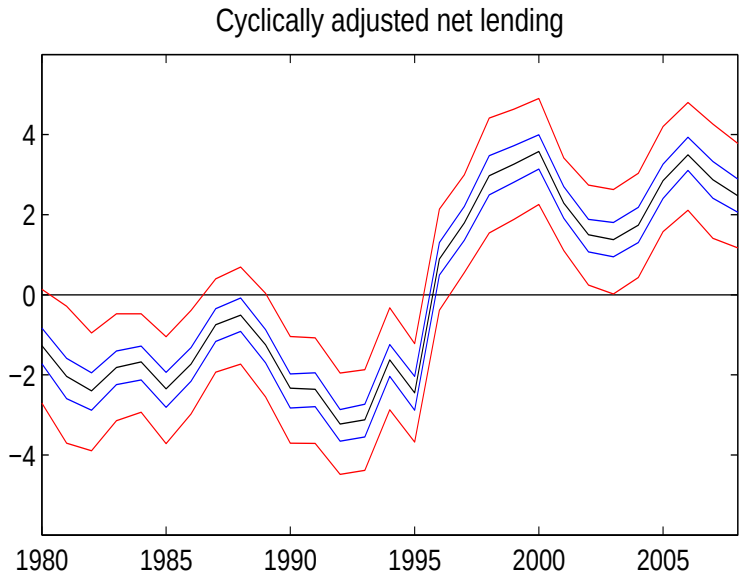


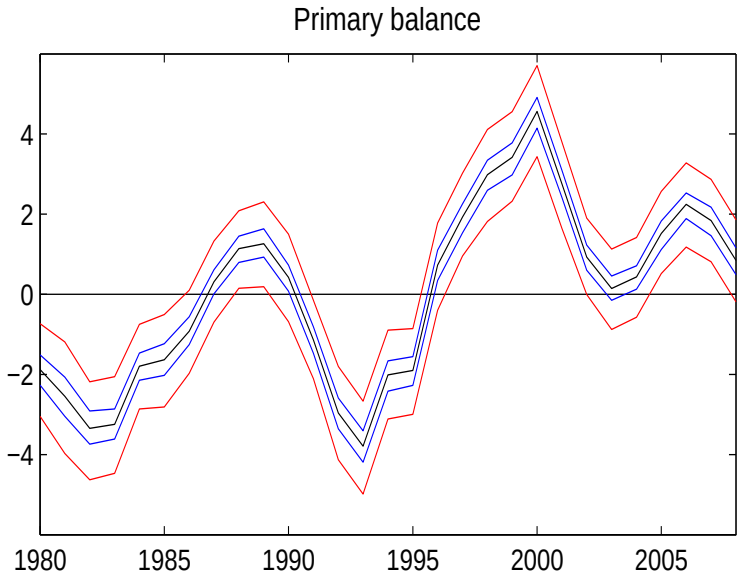
Loadings for world budget surplus factor

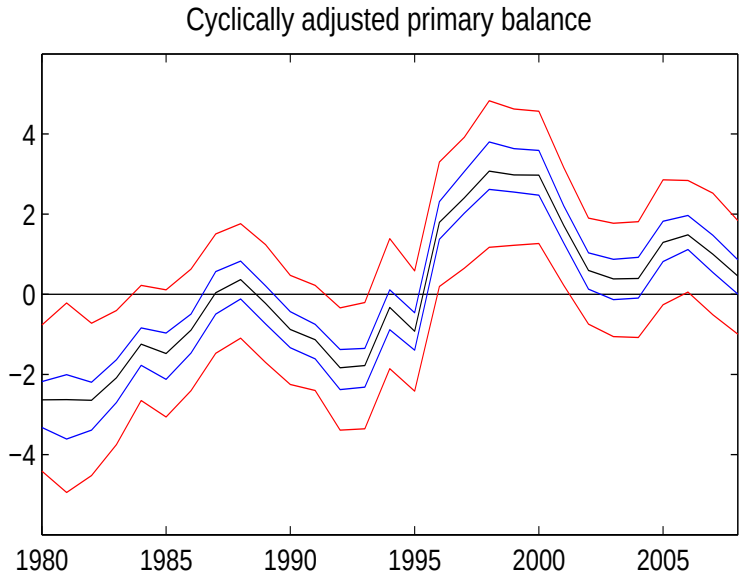


World budget surplus factor

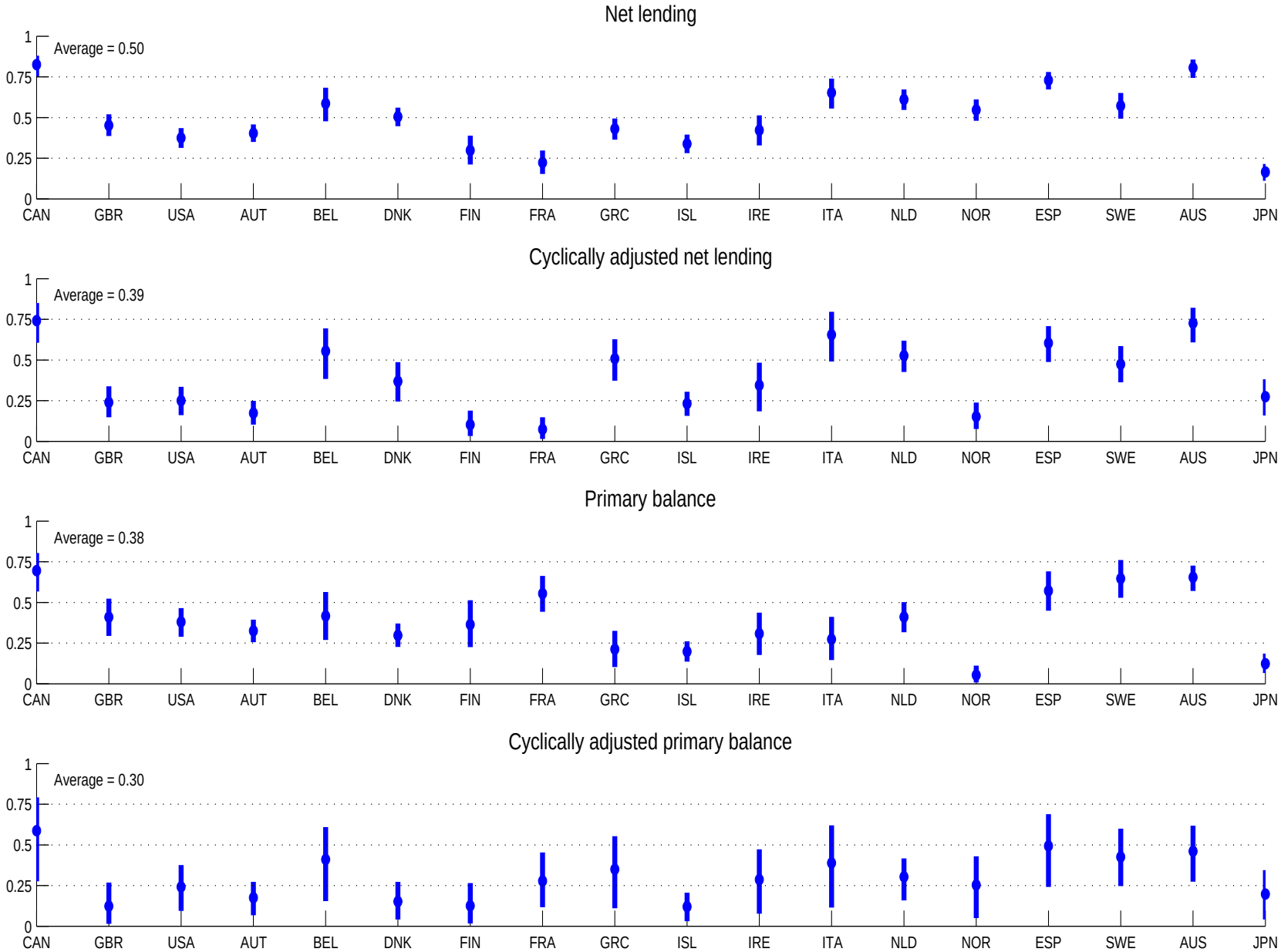




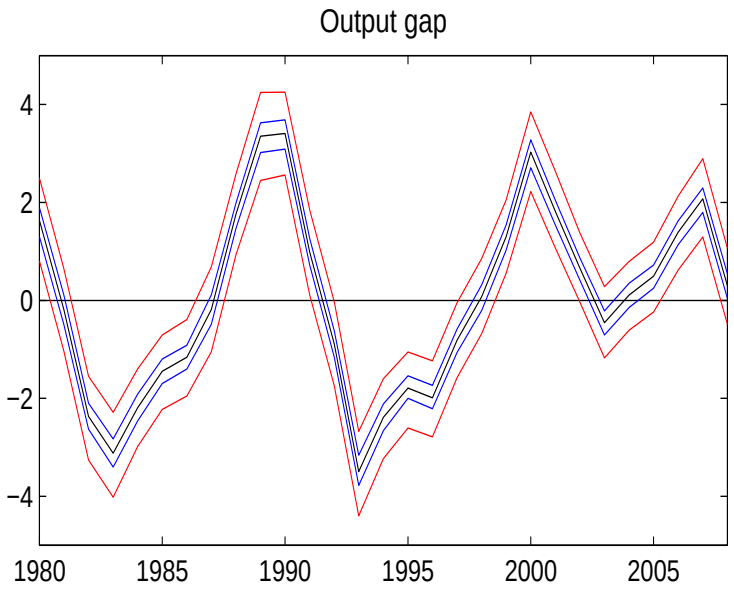


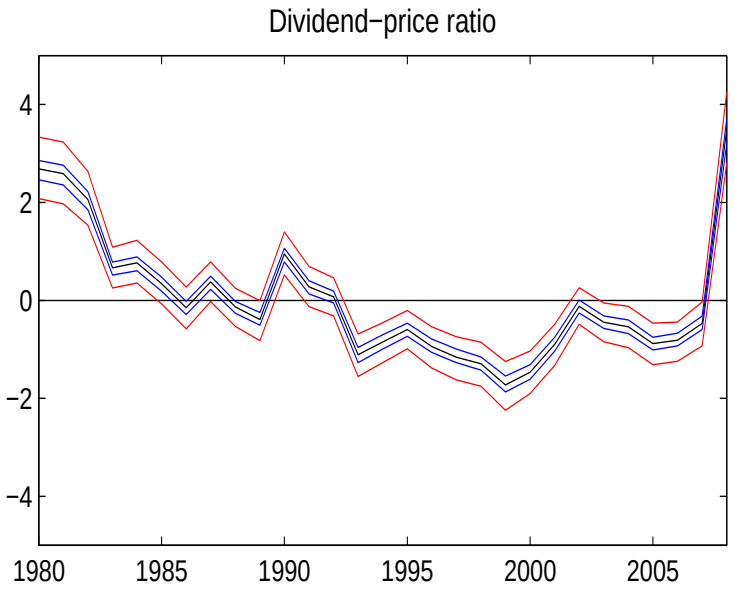


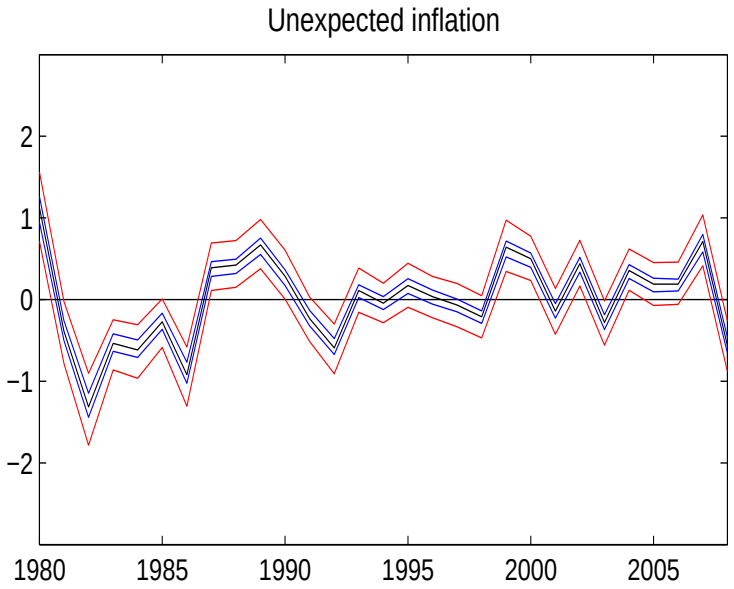
Variance decompositions, budget surpluses

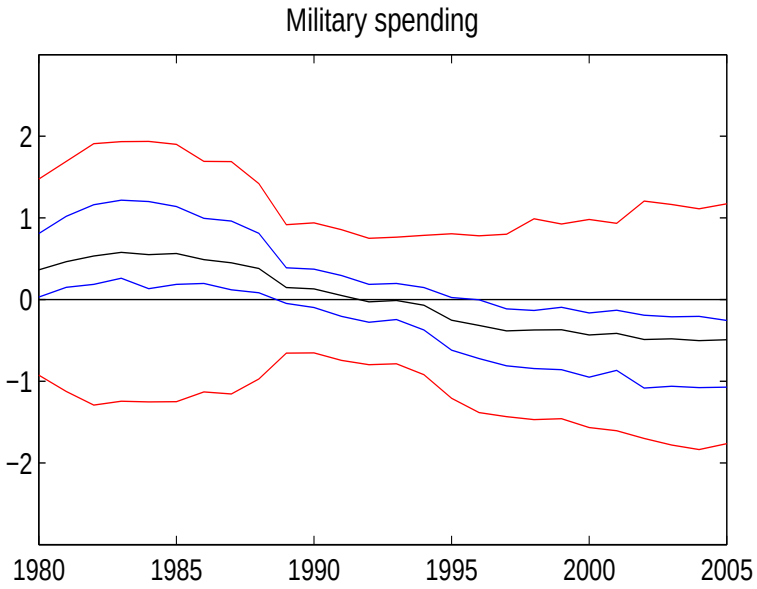


World factors, predetermined vars.









Relating predetermined variables to budget surpluses

- Bivariate regressions: $f_t^{surplus} = a + b_j f_t^j + e_t^{surplus}$
- Multiple regressions: $f_t^{surplus} = a + \sum_{j=1}^{4} b_j f_t^j + e_t^{surplus}$
- Newey-West standard errors
- Caveats
  - Measurement error (but our results are conservative)
  - RHS variables only nearly predetermined
- Expectations
  - $\uparrow$ output gap $\rightarrow \uparrow$ cyclically unadjusted surplus
  - $\uparrow$ dividend-price ratio $\rightarrow \downarrow$ surplus
  - $\uparrow$ unexpected inflation $\rightarrow \uparrow / \downarrow$ surplus
  - $\uparrow$ military spending $\rightarrow \downarrow$ surplus

Regressand = net lending, world factor

Regressor	Coefficient	t-stat.	R^2
Bivariate, 1980–2008			
Output gap, world factor	0.94	3.58	46%
Dividend-price ratio, world factor	−0.60	−1.27	9%
Unexpected inflation, world factor	2.15	3.17	19%
Military spending, world factor	−4.09	−5.11	45%
Multiple, 1980–2005			
Output gap, world factor	0.75	2.98	71%
Dividend-price ratio, world factor	−0.29	−1.26	
Unexpected inflation, world factor	−0.37	−0.61	
Military spending, world factor	−2.76	−3.72	
Multiple, excl. military, 1980–2008			
Output gap, world factor	0.98	3.30	53%
Dividend-price ratio, world factor	−0.58	−1.72	
Unexpected inflation, world factor	−0.37	−0.60	

Regressand = CA net lending, world factor

Regressor	Coefficient	t-stat.	R^2
Bivariate, 1980–2008			
Output gap, world factor	0.55	1.99	20%
Dividend-price ratio, world factor	−0.69	−1.60	15%
Unexpected inflation, world factor	1.55	2.20	12%
Military spending, world factor	−4.00	−6.18	54%
Multiple, 1980–2005			
Output gap, world factor	0.31	1.21	61%
Dividend-price ratio, world factor	−0.37	−1.42	
Unexpected inflation, world factor	−0.17	−0.27	
Military spending, world factor	−2.95	−4.22	
Multiple, excl. military, 1980–2008			
Output gap, world factor	0.56	1.81	33%
Dividend-price ratio, world factor	−0.67	−1.87	
Unexpected inflation, world factor	−0.18	−0.28	

Regressand = primary balance, world factor

Regressor	Coefficient	t-stat.	R^2
Bivariate, 1980–2008			
Output gap, world factor	0.81	4.14	48%
Dividend-price ratio, world factor	−0.83	−2.17	24%
Unexpected inflation, world factor	1.95	2.73	22%
Military spending, world factor	−3.46	−3.81	38%
Multiple, 1980–2005			
Output gap, world factor	0.79	4.43	79%
Dividend-price ratio, world factor	−0.99	−5.48	
Unexpected inflation, world factor	−0.35	−0.74	
Military spending, world factor	−0.65	−1.18	
Multiple, excl. military, 1980–2008			
Output gap, world factor	0.88	4.74	70%
Dividend-price ratio, world factor	−0.84	−3.14	
Unexpected inflation, world factor	−0.54	−1.12	

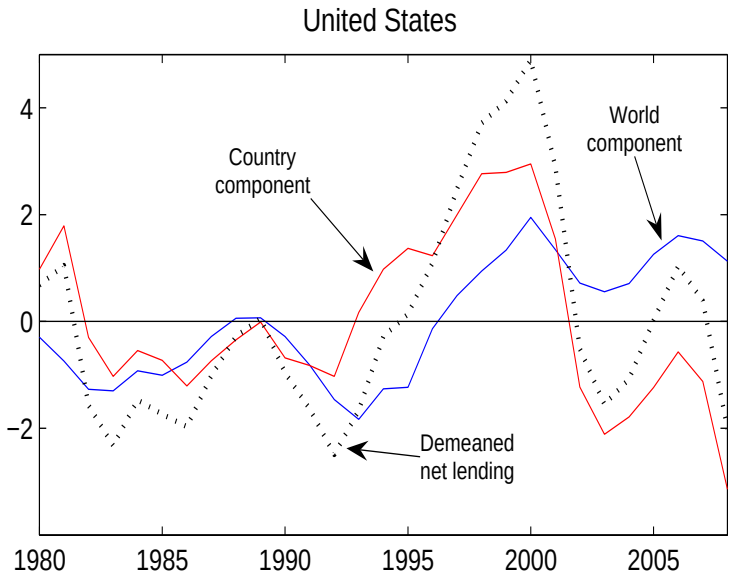
Regressand = CA primary balance, world factor

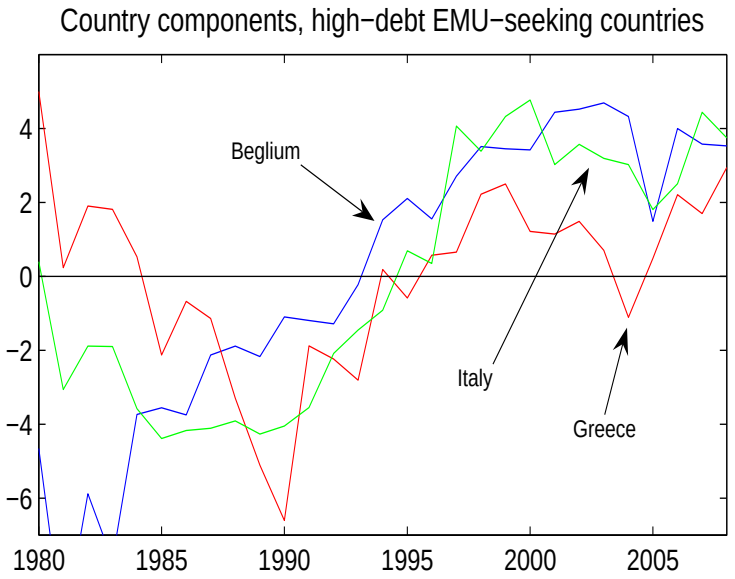
Regressor	Coefficient	t-stat.	R^2
Bivariate, 1980–2008			
Output gap, world factor	0.36	2.04	16%
Dividend-price ratio, world factor	−0.88	−2.83	44%
Unexpected inflation, world factor	1.13	1.69	12%
Military spending, world factor	−3.27	−4.69	55%
Multiple, 1980–2005			
Output gap, world factor	0.30	2.16	77%
Dividend-price ratio, world factor	−0.98	−6.07	
Unexpected inflation, world factor	−0.22	−0.60	
Military spending, world factor	−1.01	−2.10	
Multiple, excl. military, 1980–2008			
Output gap, world factor	0.40	2.57	58%
Dividend-price ratio, world factor	−0.90	−3.37	
Unexpected inflation, world factor	−0.38	−0.90	

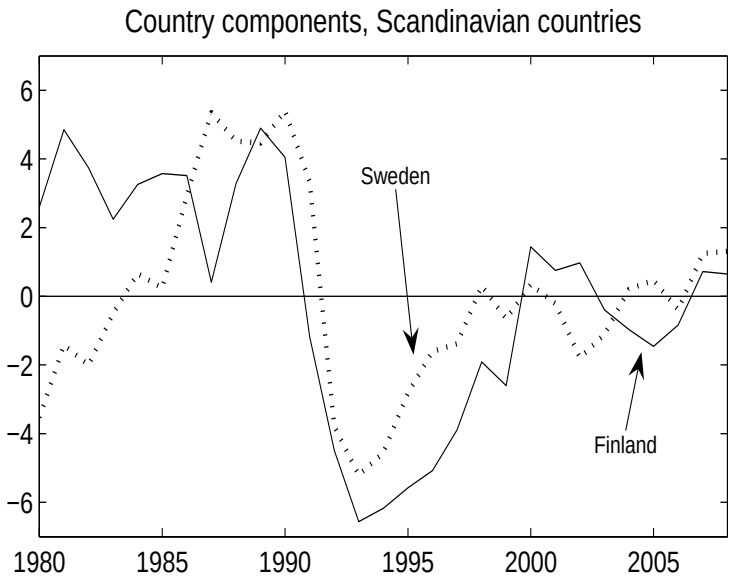
Country components

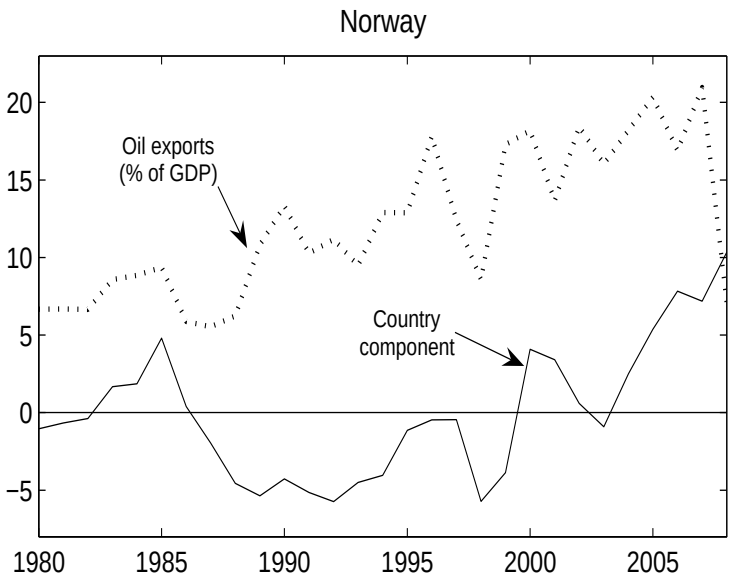
- Dynamic latent factor model $\Rightarrow$ common/country decomp.
- Common (global) component: $\hat{\beta}_i \hat{f}_t$
  - Captures typical response to global conditions
- Country component: $\hat{\epsilon}_{i,t}$
  - Gauge importance of particular national circumstances

Country components, demeaned net lending









Conclusion

- Key findings
  - Substantial global comovments in OECD budget surpluses
  - Factors in predetermined variables explain surplus factors
    - Output gap
    - Price-dividend ratio
    - Military spending
- Future research
  - Political economy: global incentives?
  - Are country responses to global shocks optimal?
  - Country characteristics related to β_i?