



Leverage dynamics and the real burden of debt

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EUROJÄRJESTELMÄ
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Sisäinen

Introduction

Key questions for macroprudential and monetary policy:

1. Why was it difficult to detect the buildup of financial vulnerabilities ahead of the global financial crisis?
2. Did the crisis cause the recession or vice versa?
3. Why was post crisis recession so severe?
 - Secular stagnation?

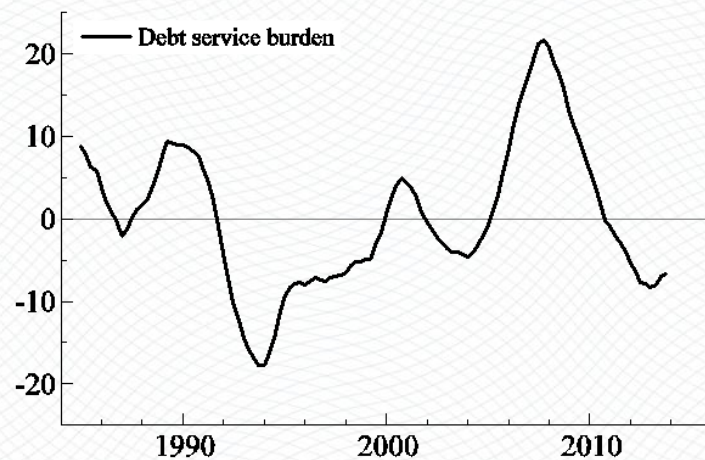
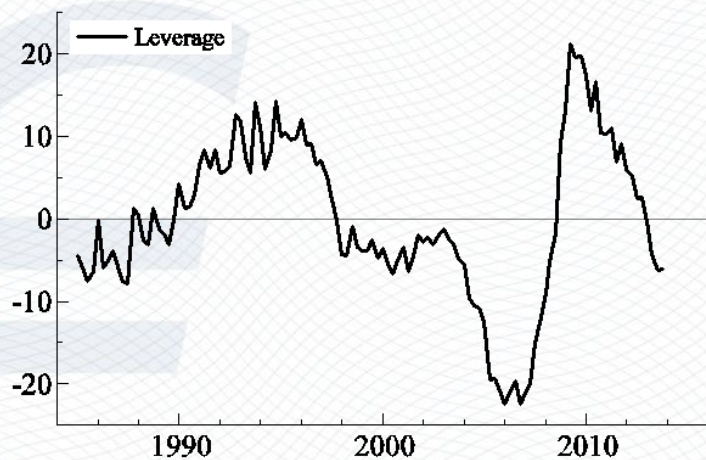
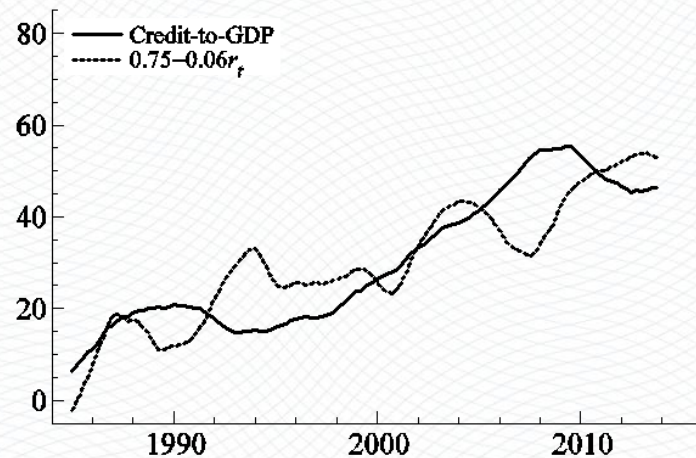
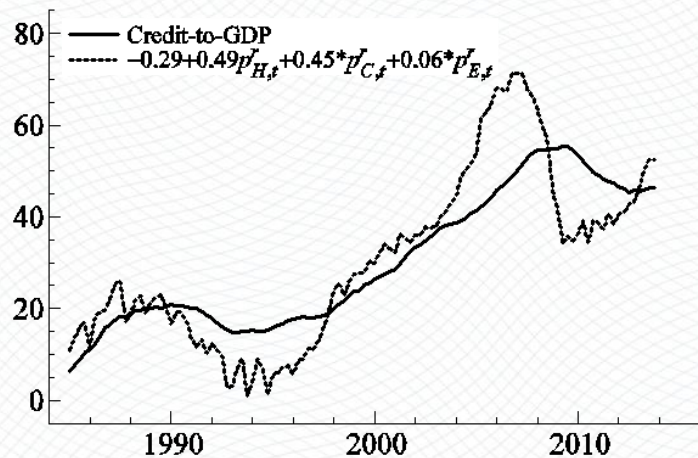
Our paper

- *Starting point:* the credit-to-GDP ratio
 - The most commonly used indicator for macro-financial imbalances
- *Key empirical questions:*
 - Is it possible to separate between sustainable and unsustainable movements in the credit-to-GDP ratio?
 - How do unsustainable movements affect the macro economy?
- *Approach:* search for empirical relationships that can account for long swings in the ratio
 - Points that satisfy such relationships “sustainable”
 - Deviations from such relationships “unsustainable”

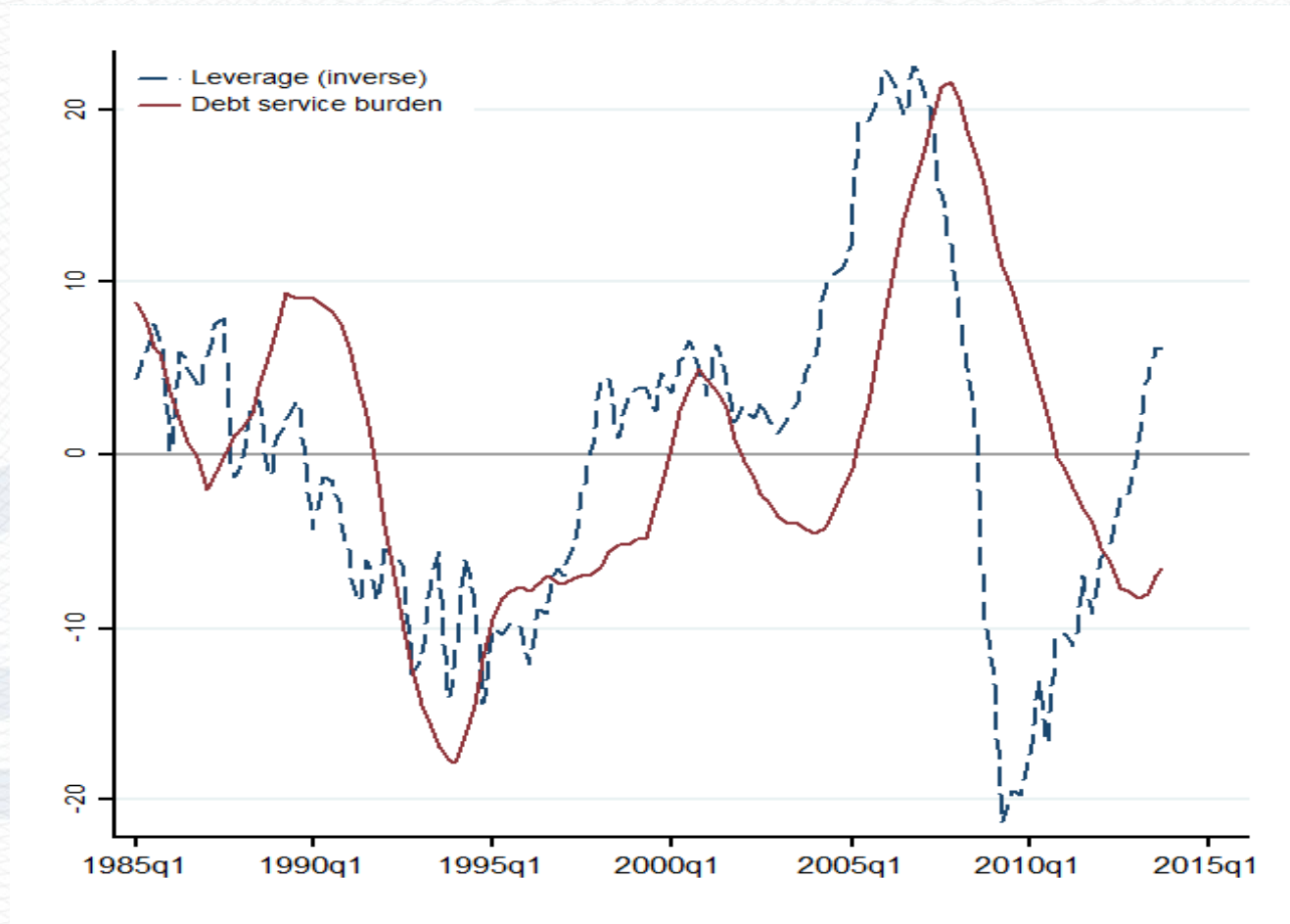
Two long-run relationships

- Leverage (credit over assets)
 - Long-run relationship between the credit-to-GDP ratio and real asset prices
- The debt service burden (DSB)
 - Long-run relationship between the credit-to-GDP ratio and lending rates
- Findings from cointegrated VAR on US data, 1985-2013
 - Both relationships are in the data
 - Their deviations account for a lot of variation in credit growth, consumption growth, asset price growth etc.
 - Results are robust to time period, inclusion of other variables, and hold at the sectoral level and in other countries

DSB and Leverage for the US...



...and their interaction

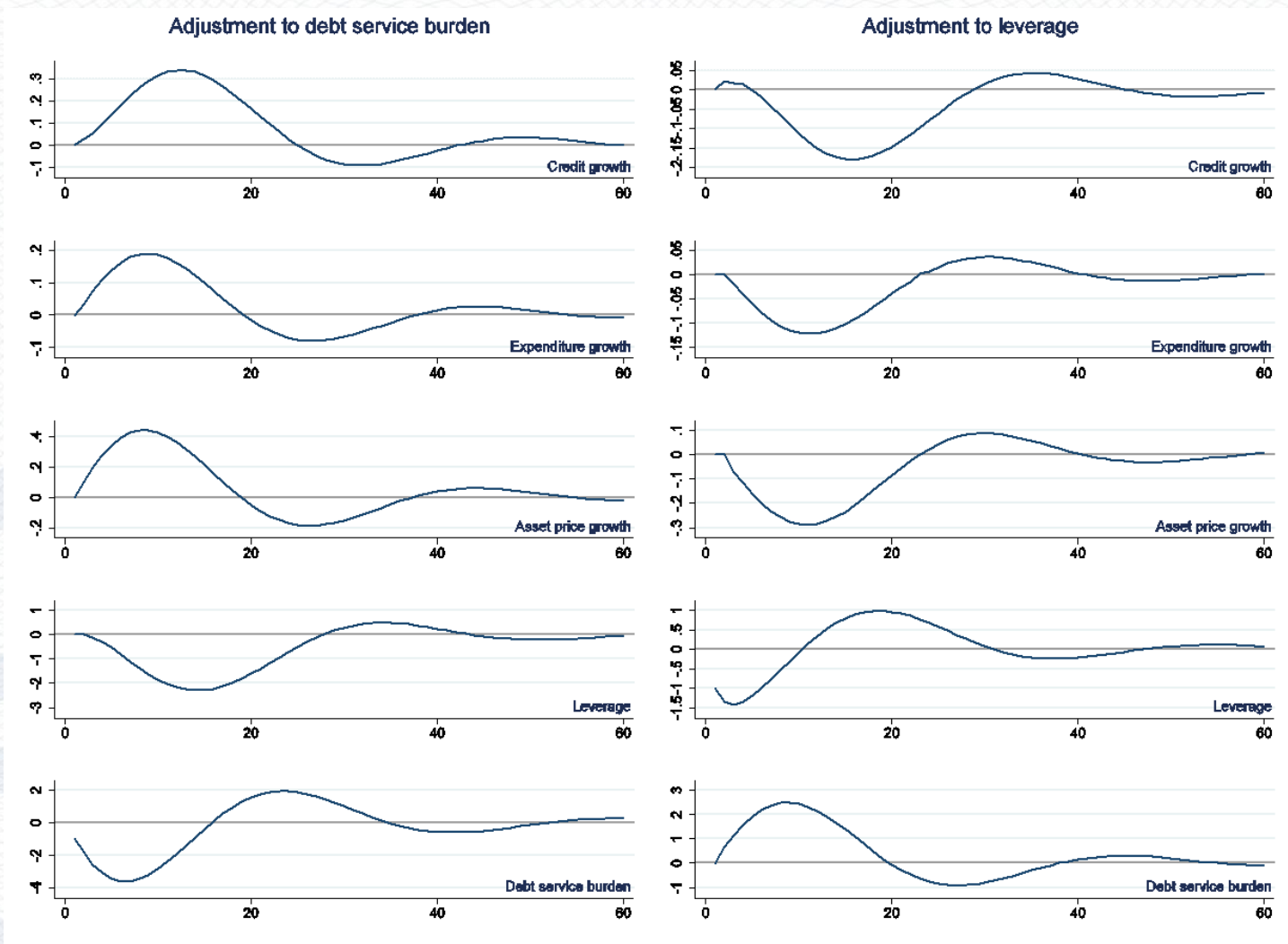


Macro effects of Leverage and DBS

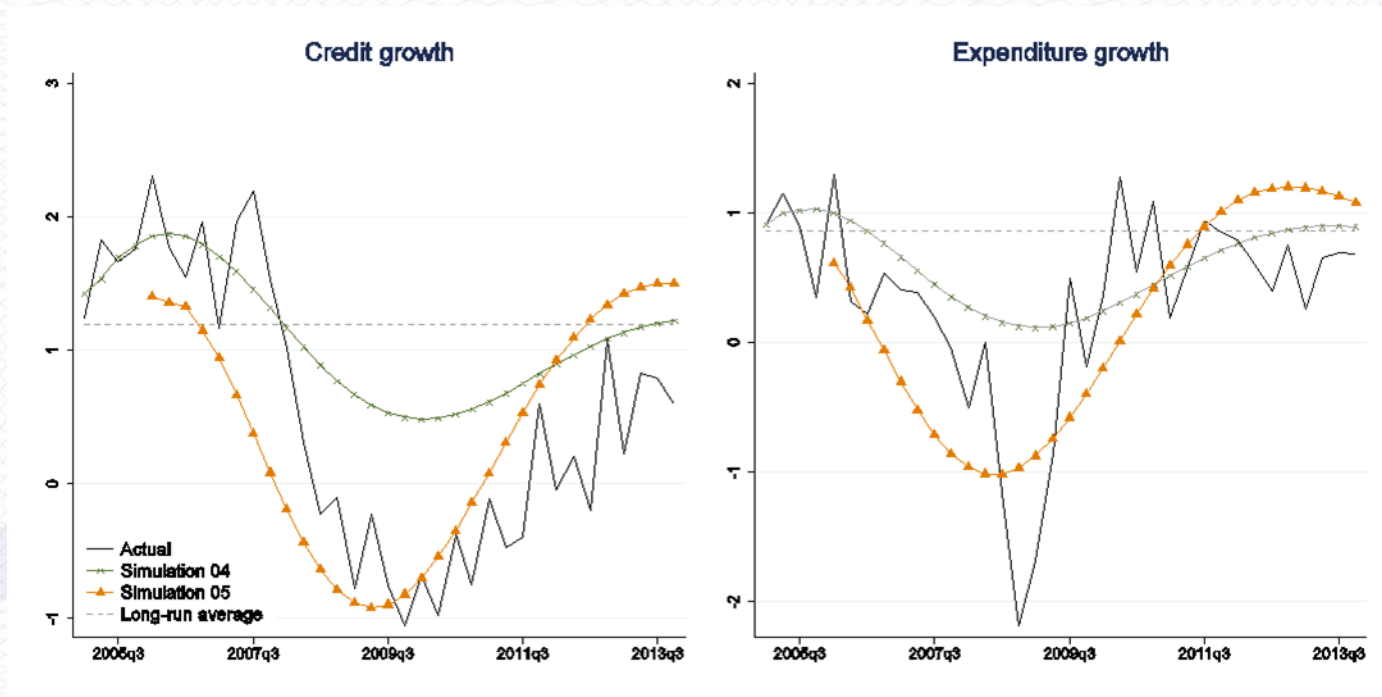
	Δcredit_t	$\Delta(\text{consumption} + \text{investment})_t$	$\Delta\text{asset prices}_t$
Adjustment to long run deviations			
Leverage _{t-1}	-0.02***	-	-
DSB _{t-1}	-0.025***	-0.026***	-0.11**
Short-run dynamics			
$\Delta\text{credit}_{t-1/t-2}$	yes	pre crisis – yes full sample - weak	yes
....			

- *In booms*: effects offset each other – difficult to spot!
- *In busts*: effects go in the same direction
 - Deep persistent recession as credit must be reduced faster than the fall in output -> secular stagnation may be overstated!

Adjustment to leverage and DSB deviations



(Pseudo) real-time prediction of the Great Recession



- Leverage and that the DSB are key propagators
 - Lehman failure only secondary effect

Conclusions

Our answers too the key questions in intro:

Q: Why didn't we see the crisis coming?

A: Leverage and DSB effects offset each other -> “growthless credit boom” where the economy appears to be on track

Q: Did the crisis cause the recession or vice versa?

A: The buildup of debt service liabilities caused the recession and the crisis

Q: Why was post crisis recession so severe?

A: To restore sustainable values, credit has to be reduced faster than the fall in output. This takes time. Secular stagnation may be overstated.

Thank you for your attention!

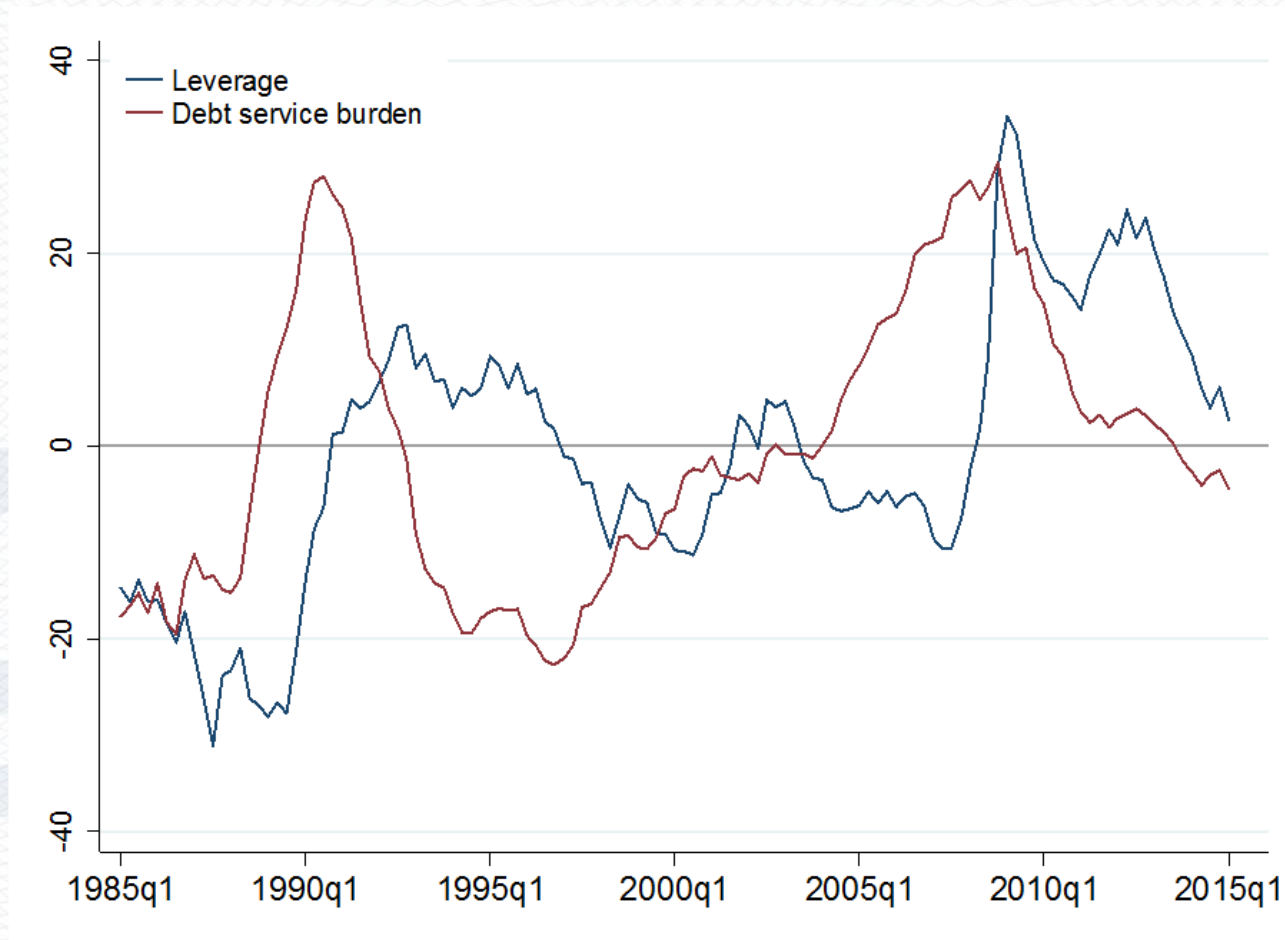
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Appendix



DSB and Leverage for the UK



Long-run system

- Unrestricted system:

$$\Delta \begin{pmatrix} cr-y \\ p_H^r \\ p_C^r \\ p_E^r \\ r \end{pmatrix}_t = \mu + \Pi \begin{pmatrix} cr-y \\ p_H^r \\ p_C^r \\ p_E^r \\ r \end{pmatrix}_{t-1} + \sum_{i=1}^2 \Pi_i \Delta \begin{pmatrix} cr-y \\ p_H^r \\ p_C^r \\ p_E^r \\ r \end{pmatrix}_{t-i} + \Gamma s_t + \varepsilon_t$$

- Restricted long-run: leverage and DSB

$$\Delta \begin{pmatrix} cr-y \\ p_H^r \\ p_C^r \\ p_E^r \\ r \end{pmatrix}_t = \mu + \alpha \begin{pmatrix} 1 & -\psi_H & -\psi_C & -\psi_E & 0 \\ 1 & 0 & 0 & 0 & \gamma \end{pmatrix} \begin{pmatrix} cr-y \\ p_H^r \\ p_C^r \\ p_E^r \\ r \end{pmatrix}_{t-1} + \sum_{i=1}^l \Pi_i \Delta \begin{pmatrix} cr-y \\ p_H^r \\ p_C^r \\ p_E^r \\ r \end{pmatrix}_{t-i} + \Gamma s_t + \varepsilon_t$$

Short-run system

- Short-run system

$$\begin{pmatrix} \Delta cr^r \\ \Delta e_p^r \\ \Delta e_o^r \\ \Delta p_A^r \\ \Delta r \end{pmatrix}_t = \alpha \begin{pmatrix} \widetilde{lev} \\ \widetilde{dsb} \end{pmatrix}_{t-1} + \sum_{i=1}^2 \Pi_i \begin{pmatrix} \Delta cr^r \\ \Delta e_p^r \\ \Delta e_o^r \\ \Delta p_A^r \\ \Delta r \end{pmatrix}_{t-i} + \Gamma s_t + \epsilon_t$$

Short-run system

	Unrestricted system					Restricted system				
	Δcr_t^r	$\Delta e_{P,t}^r$	$\Delta e_{O,t}^r$	$\Delta p_{A,t}^r$	Δr_t	Δcr_t^r	$\Delta e_{P,t}^r$	$\Delta e_{O,t}^r$	$\Delta p_{A,t}^r$	Δr_t
	Adjustment coefficients to leverage and the debt service burden									
\widetilde{lev}_{t-1}	-0.021 -2.86	0.007 0.79	-0.050 -0.91	-0.039 -0.76	-0.004 -2.42	-0.020 -4.07				-0.003 -2.69
\widetilde{dsb}_{t-1}	-0.027 -3.99	-0.021 -2.52	0.152 3.07	-0.108 -2.28	-0.003 -2.32	-0.025 -5.54	-0.026 -5.09	0.191 5.92	-0.106 -3.75	-0.002 -2.15
	Short-run dynamics									
Δcr_{t-1}^r	0.195 1.86	0.082 0.65	-0.874 -1.15	-0.046 -0.06	0.007 0.36	0.275 3.97				
Δcr_{t-2}^r	0.570 5.59	0.031 0.25	0.266 0.36	0.649 0.92	-0.029 -1.49	0.454 7.01			0.571 2.15	-0.024 -2.01
$\Delta e_{P,t-1}^r$	0.168 1.13	0.398 2.22	0.752 0.70	0.926 0.90	0.035 1.23		0.474 7.99			0.061 4.53
$\Delta e_{P,t-2}^r$	-0.166 -1.12	0.055 0.31	1.175 1.09	-0.812 -0.79	-0.041 -1.42			2.192 6.07		-0.037 -2.54
$\Delta e_{O,t-1}^r$	0.014 0.66	0.030 1.15	0.030 0.19	-0.036 -0.24	-0.004 -1.03		0.035 3.73			
$\Delta e_{O,t-2}^r$	-0.023 -1.15	-0.025 -1.06	0.202 1.41	-0.265 -1.96	-0.002 -0.65			0.112 1.96		
$\Delta p_{A,t-1}^r$	0.008 0.52	0.016 0.85	-0.157 -1.40	-0.152 -1.43	-0.002 -0.80					
$\Delta p_{A,t-2}^r$	-0.005 -0.30	0.020 1.05	-0.110 -0.98	-0.044 -0.41	-0.002 -0.53					
Δr_{t-1}	-0.442 -1.03	-0.118 -0.23	2.881 0.93	-1.551 -0.52	1.024 12.30					1.033 14.00
Δr_{t-2}	0.664 1.53	0.157 0.30	-1.129 -0.36	3.301 1.10	-0.147 -1.75					-0.174 -2.38

System over time

	1985q1-2004q4 system					1985q1-2013q1 system				
	Δcr_t^r	$\Delta e_{P,t}^r$	$\Delta e_{O,t}^r$	$\Delta p_{A,t}^r$	Δr_t	Δcr_t^r	$\Delta e_{P,t}^r$	$\Delta e_{O,t}^r$	$\Delta p_{A,t}^r$	Δr_t
Adjustment coefficients to long-run deviations										
\tilde{lev}_{t-1}	-0.019 -2.08				-0.005 -2.39	-0.020 -4.07				-0.003 -2.69
\tilde{dsb}_{t-1}	-0.026 -3.52	-0.039 -4.86	0.217 4.68	-0.084 -2.12	-0.006 -3.13	-0.025 -5.54	-0.026 -5.09	0.191 5.92	-0.106 -3.75	-0.002 -2.15
Short-run dynamics										
Δcr_{t-1}^r	0.297 3.47	0.273 3.60	-1.774 -3.92			0.275 3.97				
Δcr_{t-2}^r	0.476 6.02			1.337 3.41		0.454 7.01			0.571 2.15	-0.024 -2.01
$\Delta e_{P,t-1}^r$			1.557 4.52		0.066 3.80		0.474 7.99			0.061 4.53
$\Delta e_{P,t-2}^r$			3.033 6.79		-0.048 -2.83			2.192 6.07		-0.037 -2.54
$\Delta e_{O,t-1}^r$							0.035 3.73			
$\Delta e_{O,t-2}^r$			0.279 3.56					0.112 1.96		
$\Delta p_{A,t-1}^r$				-0.204 -2.06						
$\Delta p_{A,t-2}^r$				-0.205 -2.03						
Δr_{t-1}					0.901 22.60					1.033 14.00
Δr_{t-2}										-0.174 -2.38

Table 4: Estimated coefficients of the 1985q1-2004q4 and the full-sample system. The complete estimation results for the 1985q1-2004q4 system are shown in Table 9 in Appendix B.