Sustainability of public finances in EU-candidate countries*

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April 2012

*The views expressed in the paper are those of the author and do not necessarily reflect the views of the NBRM

Outline

- Research aim
- The requirement and definition of fiscal sustainability
- Mathematical approach to sustainability of public finances
- Estimation of the sustainability of public finances in EU candidate countries and results
- Conclusions

Research aims

- To test whether the fiscal policies of EU candidate countries follow a sustainable path.
  - a "burning issue" in Europe at the present time.
- To apply new panel unit root and cointegration techniques which will enable us to alleviate the problem of relatively short-spanned time series data characteristic for the analysed countries.
- To estimate a panel cointegration model which will allow us to make difference between "strong" and "weak" sustainability.

The requirement and definition of fiscal sustainability

- The requirement for fiscal sustainability
- Legal:
  - Copenhagen economic criteria for EU membership
  - Maastricht convergence criteria for accession in EMU
- Policy:
  - sound government finances are a prerequisite for price and macroeconomic stability and strengthen the conditions for sustainable growth.
  - the recent global economic crisis only emphasized the importance of prudent fiscal policies for avoiding painful adjustment processes.

The requirement and definition of fiscal sustainability

- "Virtually any pattern of deficit would be sustainable if it were possible to borrow money and pay the interest by borrowing more".

  -Wilcox (1989)

- Can this exist in real life?
  - Dynamic efficiency and no Ponzi games
  - Government budget constraints

The requirement and definition of fiscal sustainability

- Several definitions of fiscal sustainability:
  - EC: the ability of a government to assume the financial burden of its debt currently and going forward.
  - IMF: a borrower is expected to be able to continue servicing its debt without an unrealistically large future correction to the balance of income and expenditure.
  - Government’s ability to indefinitely maintain the same set of policies while remaining solvent (Burnside, 2005, p.11).
- Solvency, liquidity, and sustainability

The requirement and definition of fiscal sustainability

- "Our" definition of fiscal sustainability:
  - a situation in which the intertemporal budget constraint is satisfied without the need of major adjustment of the fiscal position given the financing costs in the market.
- The linchpin:
  - the government budget constraint:
    - single-period
    - intertemporal
- Criticisms

Mathematical approach to sustainability of public finances

- From economic to econometric model

$$gg_t - \rho_t = \sum_{n=0}^{\infty} \left(\frac{1+g}{1+r} \right)^{n+1} [\Delta\rho_{t+n} - \Delta e_{t+n}] + \lim_{n \to \infty} \Delta b_{t+n} \left(\frac{1+g}{1+r} \right)^{n+1}$$

$$\lim_{n \to \infty} \Delta b_{t+n} \left(\frac{1+g}{1+r} \right)^{n+1} = 0$$ *the no-Ponzi condition*

$$gg_t - \rho_t = \sum_{n=0}^{\infty} \left(\frac{1+g}{1+r} \right)^{n+1} [\Delta\rho_{t+n} - \Delta e_{t+n}]$$

- Detailed formulae can be found in the paper.

The empirical model

$$\rho_{it} = \alpha_i + \beta_i gg_{it} + u_{it}$$

where

- $i=1,2,\ldots,N$ is the number of countries;
- $t=1,2,\ldots,T_i$ is the number of periods;
- ρ_{it} is the dependent variable;
- gg_{it} is the explanatory variable;
- α_i is a country-specific intercept;
- β_i is a country specific slope; and
- u_{it} is a mean zero error term.

Estimation of the sustainability of public finances in EU candidate countries

- Data description:
- Unbalanced panel of five EU candidate countries: Macedonia, Croatia, Montenegro, Turkey and Iceland.
- Variables: total government revenues and government expenditures expressed as ratios to GDP
- Frequency: annual
- Database: European Bank for Reconstruction and Development (EBRD), and Eurostat

Estimation of the sustainability of public finances in EU candidate countries

- Descriptive statistics

Table 1: Summary statistics for fiscal variables for the overall panel (1989-2010)

Variable		Mean	Standard deviation	Minimum	Maximum
ρ	overall	34.31	9.69	13.80	50.10
	between		9.28	19.29	42.22
	within		3.89	18.43	43.64
gg	overall	37.36	9.01	17.1	57.80
	between		7.66	24.82	44.16
	within		5.12	21.58	52.37

Source: Author's calculations.

Estimation of the sustainability of public finances in EU candidate countries

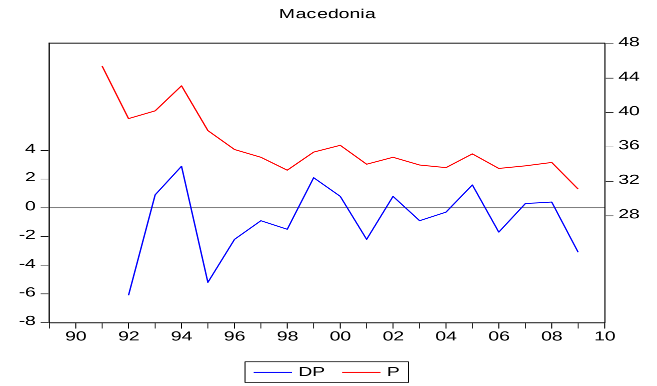
Table 2: Summary statistics for fiscal variables, by country

Country	Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Macedonia	ρ	19	36.07	3.61	31.1	45.4
	gg	19	38.58	6.37	33.1	53.6
Croatia	ρ	18	37.81	3.67	25.90	43.80
	gg	18	41.07	5.01	25.30	48.80
Montenegro	ρ	10	41.08	7.97	25.2	50.1
	gg	10	41.64	7.11	27.3	50.4
Turkey	ρ	22	19.29	2.73	13.8	22.3
	gg	22	24.82	4.34	17.1	33.5
Iceland	ρ	21	42.22	2.80	38.30	48.00
	gg	21	44.16	4.06	40.70	57.80

Note: The analysed time period is as follows: for Macedonia 1991-2009, for Croatia 1992-2009, for Montenegro 2000-2009, for Turkey 1989-2010 and for Iceland 1990-2010.
Source: Author's calculations.

Estimation of the sustainability of public finances in EU candidate countries

- Econometric methodology
  - Unit root testing
  - Panel cointegration analysis
- Pooled mean group (PMG) estimator (Pesaran, Shin and Smith, 1999)
- xtpmg in Stata (Blackburne and Frank, 2007)
- By combining pooling and averaging it allows for the short-run and adjustment coefficients to differ (authonomy of the national fiscal policies) but imposes homogeneity of the long-run cointegrating coefficients (Copenhagen and Maastriht criteria)
- It seems reasonable to expect similar long-run equilibrium relationships across countries due to budget constraints (Pesaran et al.,1999).


Macedonia
DP
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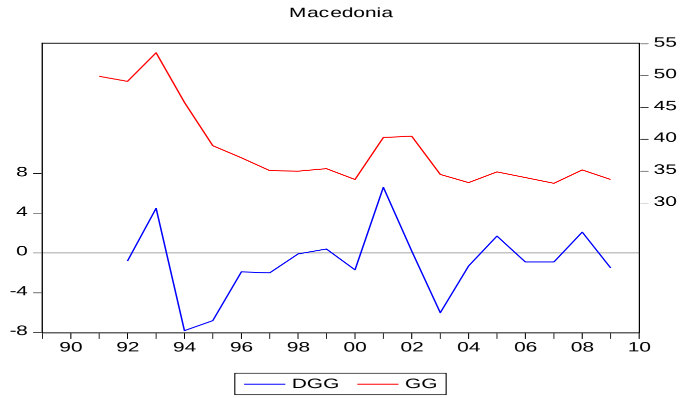
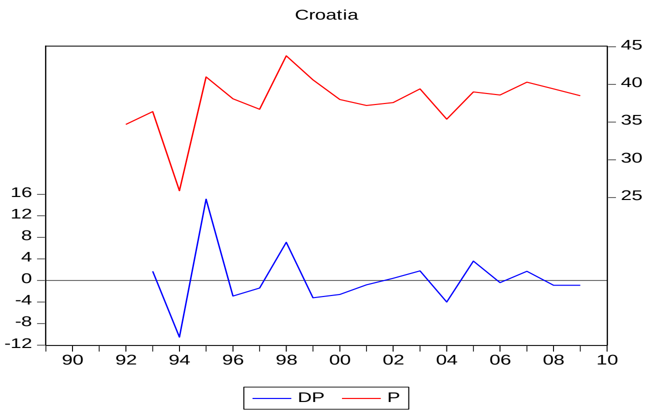

Macedonia
DGG
GG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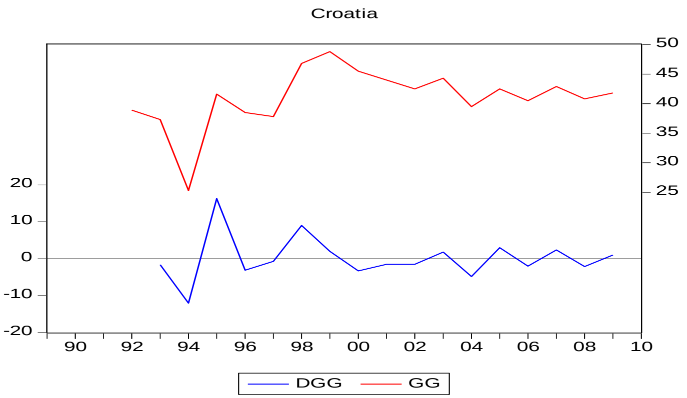
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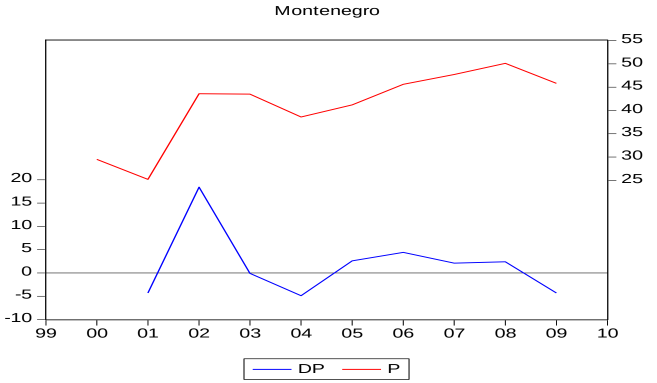
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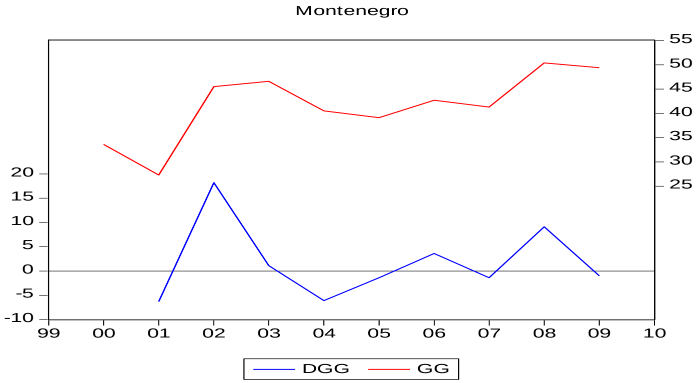
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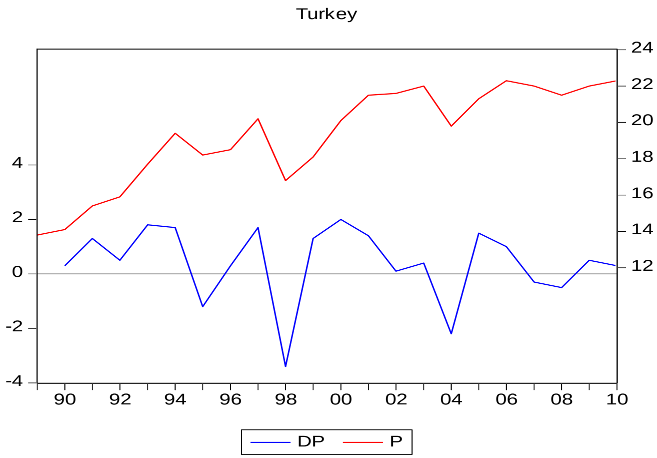
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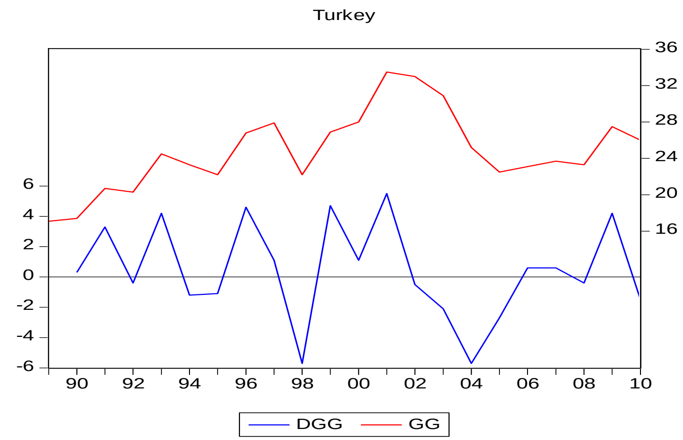
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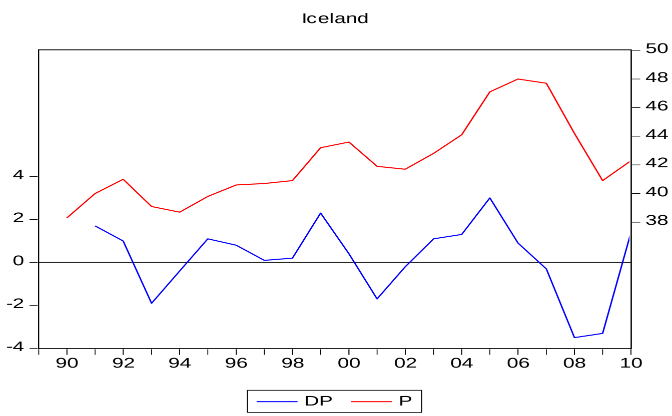
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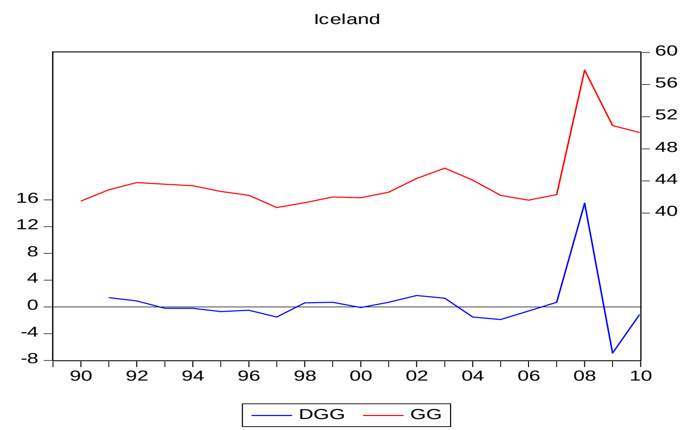
Iceland
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DGG GG

Table 3: Individual unit root tests

Country	Variable	Methodology	Integration	p-value	c	t	Lags	DW
Macedonia	**p**	ADF	I(1)	0.0796	✓	-	0	1.905
		ADF	I(1)	0.0521	✓	✓	0	1.698
		DF-GLS	I(1)	>0.05	✓	-	0	1.571*
		DF-GLS	I(1)	>0.01	✓	✓	0	1.509*
		PP	I(1)	0.0842	✓	-	0	1.905
		PP	I(1)	0.0539	✓	✓	0	1.698
	gg	ADF	I(1)	0.3506	✓	-	0	1.879
		ADF	I(1)	0.6337	✓	✓	0	1.745
		DF-GLS	I(1)	>0.1	✓	-	0	1.708
		DF-GLS	I(1)	> 0.1	✓	✓	0	1.674
		PP	I(1)	0.3398	✓	-	0	1.879
		PP	I(1)	0.6214	✓	✓	0	1.745
Croatia	**p**	ADF	I(0)	0.0074	✓	-	0	2.030
		ADF	I(1)	0.0164	✓	✓	0	1.985
		DF-GLS	I(0)	<0.01	✓	-	0	2.012
		DF-GLS	I(0)	<0.01	✓	✓	0	1.982
		PP	I(0)	0.0074	✓	-	0	2.030
		PP	I(1)	0.0164	✓	✓	0	1.985
	gg	ADF	I(1)	0.0813	✓	-	0	2.109
		ADF	I(1)	0.1686	✓	✓	0	2.022
		DF-GLS	I(0)	<0.01	✓	-	0	2.106
		DF-GLS	I(1)	>0.05	✓	✓	0	2.023
		PP	I(1)	0.0808	✓	-	0	2.109
		PP	I(1)	0.1686	✓	✓	0	2.022

Montenegro	**p**	ADF	I(1)	0.3575	✓	-	0	2.190
		ADF	I(0)	0.0046	✓	✓	1	2.242
		DF-GLS	I(1)	>0.05	✓	-	0	1.983
		DF-GLS	I(0)	<0.01	✓	✓	1	0.765*
		PP	I(1)	0.3502	✓	-	0	2.190
		PP	I(1)	0.2292	✓	✓	1	1.802
	gg	ADF	I(1)	0.3571	✓	-	0	1.924
		ADF	I(1)	0.0532	✓	✓	0	1.885
		DF-GLS	I(1)	<0.01	✓	-	1	1.051*
		DF-GLS	I(1)	>0.05	✓	✓	0	1.753
		PP	I(1)	0.2976	✓	-	1	1.924
		PP	I(1)	0.3159	✓	✓	0	1.757
Turkey	**p**	ADF	I(1)	0.3217	✓	-	0	2.352
		ADF	I(1)	0.1594	✓	✓	0	1.982
		DF-GLS	I(1)	>0.01	✓	-	0	2.085
		DF-GLS	I(1)	>0.05	✓	✓	0	1.908
		PP	I(1)	0.3105	✓	-	0	2.352
		PP	I(1)	0.1530	✓	✓	0	1.982
	gg	ADF	I(1)	0.1835	✓	-	0	1.969
		ADF	I(1)	0.5322	✓	✓	0	1.938
		DF-GLS	I(1)	>0.05	✓	-	0	1.904
		DF-GLS	I(1)	>0.1	✓	✓	0	1.857
		PP	I(1)	0.1740	✓	-	0	1.969
		PP	I(1)	0.5168	✓	✓	0	1.938
Iceland	p	ADF	I(1)	0.2745	✓	-	0	1.501*
		ADF	I(0)	0.0035	✓	✓	1	2.376
		DF-GLS	I(1)	>0.05	✓	-	1	1.500*
		DF-GLS	I(0)	<0.01	✓	✓	1	1.791
		PP	I(1)	0.1757	✓	-	1	1.231*
		PP	I(0)	0.0002	✓	✓	1	1.172*
	gg	ADF	I(1)	0.2113	✓	-	0	2.008
		ADF	I(1)	0.1956	✓	✓	0	1.943
		DF-GLS	I(1)	>0.01	✓	-	0	1.979
		DF-GLS	I(1)	>0.05	✓	✓	0	1.936
		PP	I(1)	0.2081	✓	-	0	2.008
		PP	I(1)	0.1951	✓	✓	0	1.943

Notes: The number of lags is chosen by the Schwarz Information Criterion in EViews 6.0. * indicates possible problem of serial correlation according to DW.
Source: Author’s calculations

Results

Table 4: Summary of panel unit root tests for government revenues to GDP ratios

Methodology	Test statistic					p-value			
	Null: Unit root (individual unit root process)								
	No. of lags		AIC	SIC	HQIC		AIC	SIC	HQIC
Im-Pesaran-Shin t-bar	0	-2.46				>0.01			
Im-Pesaran-Shin w-t-bar	0-2		-1.86		-1.86		0.0314		0.0314
	0-1			-2.24				0.0127	
	4*		-2.07	-3.21	-2.07		0.0192	0.0007	0.0192
Fisher – ADF Z	0-2		-1.87		-1.87		0.0307		0.0307
	0-1			-2.35				0.0093	
Fisher – PP Z**	/	-2.60				0.0047			

Notes: * due to insufficient number of observations Montenegro was excluded when performing the test.
** performed with Newey-West bandwidth selection using Bartlett kernel.
Source: Author's calculations

Results

Table 5: Summary of panel unit root tests for government expenditures to GDP ratios

Methodology	Test statistic					p-value			
	Null: Unit root (individual unit root process)								
	No. of lags		AIC	SIC	HQIC		AIC	SIC	HQIC
Im-Pesaran-Shin t-bar	0		-2.18	-2.18	-2.18		>0.05	>0.05	>0.05
Im-Pesaran-Shin w-t-bar	0		-1.51	-1.51	-1.51		0.0659	0.0659	0.0659
	4		-1.95	-1.63	-1.95		0.0257	0.0514	0.0257
Fisher – ADF Z	0		-1.72	-1.72	-1.72		0.0427	0.0427	0.0427
Fisher – PP Z*	/	-1.72				0.0427			

Notes: * due to insufficient number of observations Montenegro was excluded when performing the test.
** performed with Newey-West bandwidth selection using Bartlett kernel.
Source: Author's calculations.

Results

Table 6: PMG estimation output (dependent variable Δp)

Variables	(1) Overall	(2) Macedonia	(3) Croatia	(4) Montenegro	(5) Turkey	(6) Iceland
ec	-0.442***	-0.998***	-0.661***	-0.342**	-0.181	-0.0288
	(0.047)	(0.160)	(0.137)	(0.144)	(0.111)	(0.131)
D.gg	0.170	-0.321***	0.471***	0.636***	0.195**	-0.128
	(0.179)	(0.109)	(0.0934)	(0.132)	(0.0848)	(0.0907)
gg	0.411***					
	(0.0474)					
Constant	8.99**	19.63***	13.91***	8.585**	1.913*	0.945
	(3.553)	(3.516)	(2.921)	(3.546)	(1.044)	(3.169)
Observations	85	85	85	85	85	85

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. A country-secific constant term is included. Δ denotes difference.

Source: Author's calculations

Conclusions

- The evidence only supports the weak sustainability proposition, which implies a moderately explosive debt process.
- We find fiscal policies sustainable at least in the "weak" sense in Macedonia, Croatia and Montenegro, the public finances of Turkey are borderline sustainable, while Iceland's policy is unsustainable.
- Policy implication: impaired ability to market debt in the long run given the increased risk of default.
- Unsustainable fiscal policies cannot be maintained indefinitely by the government while remaining solvent.
- By implication, if fiscal policies are unsustainable reversal should be expected at some point.
  - e.g. Iceland

Thank you for your attention!