XIV Seminário Anual de Metas para a Inflação

Optimal Capital Flow Taxes in Latin America

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Motivation

- **Foreign liabilities imply future capital outflows, which may coincide with and aggravate economic downturns.**
- **Individual agents tend to ignore these aggregate effects when making liabilities decisions**
- **A macroprudential capital inflow tax should disincentive inflows and the associated liabilities**
- **Optimally, it should reflect the expected cost of excessive debt.**

Literature

- Capital inflow bonanzas provide early warning of economic crisis (Reinhart and Reinhart, 2008)

- Sudden stop models explain these crisis by the mutual amplification of (i) real economic shocks (ii) adverse asset prices, (iii) tighter credit constraints (Mendoza, 2010, AER)

- Agents impact on future asset prices is an externality; Pigouvian capital flow tax improves market outcome (Jeane and Korinek, 2010, AER)

Main Contribution

- Empirical framework to estimate optimal capital inflow tax and confidence intervals
- Applied to Latin American economies

- Three econometric models for panel data:
  - Early warning of international crisis;
  - Amplification dynamics of credit constraints;
  - Severity of the crisis.

Optimal Tax: Definition

- By the motivation, outflow in credit constrained states should be penalized ex-ante.

- That is, inflows should be taxed by the expected cost of the externality they imply. The result is:

$$t^* = E(\tau\tilde{R}) = E(\tau\tilde{R}|crisis)\pi(crisis)$$

where *tau* is the externality kernel and *R* is the return on the underlying liability.

Optimal Tax: Externality Kernel

- **Externality Kernel**
  - **Difference between private and social kernel**

$$\tau(\omega) = \frac{\kappa\sigma}{1-\kappa\sigma} \frac{u'(c_1(\omega)) - \beta R u'(c_2(\omega))}{E u'(c_1)}$$

  - **First term measures the amplification dynamics**
  - **Second term measures how tight is the constrain; that is, the severity of the crisis**

Optimal Tax: Approximation

- Assume
  - Constant relative risk aversion (equal to 2)
  - Consumption growth approximated by output growth
  - Amplification effect approximated by the current account reaction to output

- The optimal tax can be written as

$$t^* = \underbrace{-2E\left(\hat{y}\tilde{R}\middle|crisis\right)}_{severity}\underbrace{E(-\partial ca/\partial y\,|crisis)}_{amplification}\underbrace{\pi(crisis)}_{likelihood}$$

Data

- 17 LatAm countries, including 7 largest
- Yearly data from 1970-2007
- Crisis = Sudden Stop = (Mendoza and Smith, 2006, JIE)
  - i. current account improvement (or nfa)

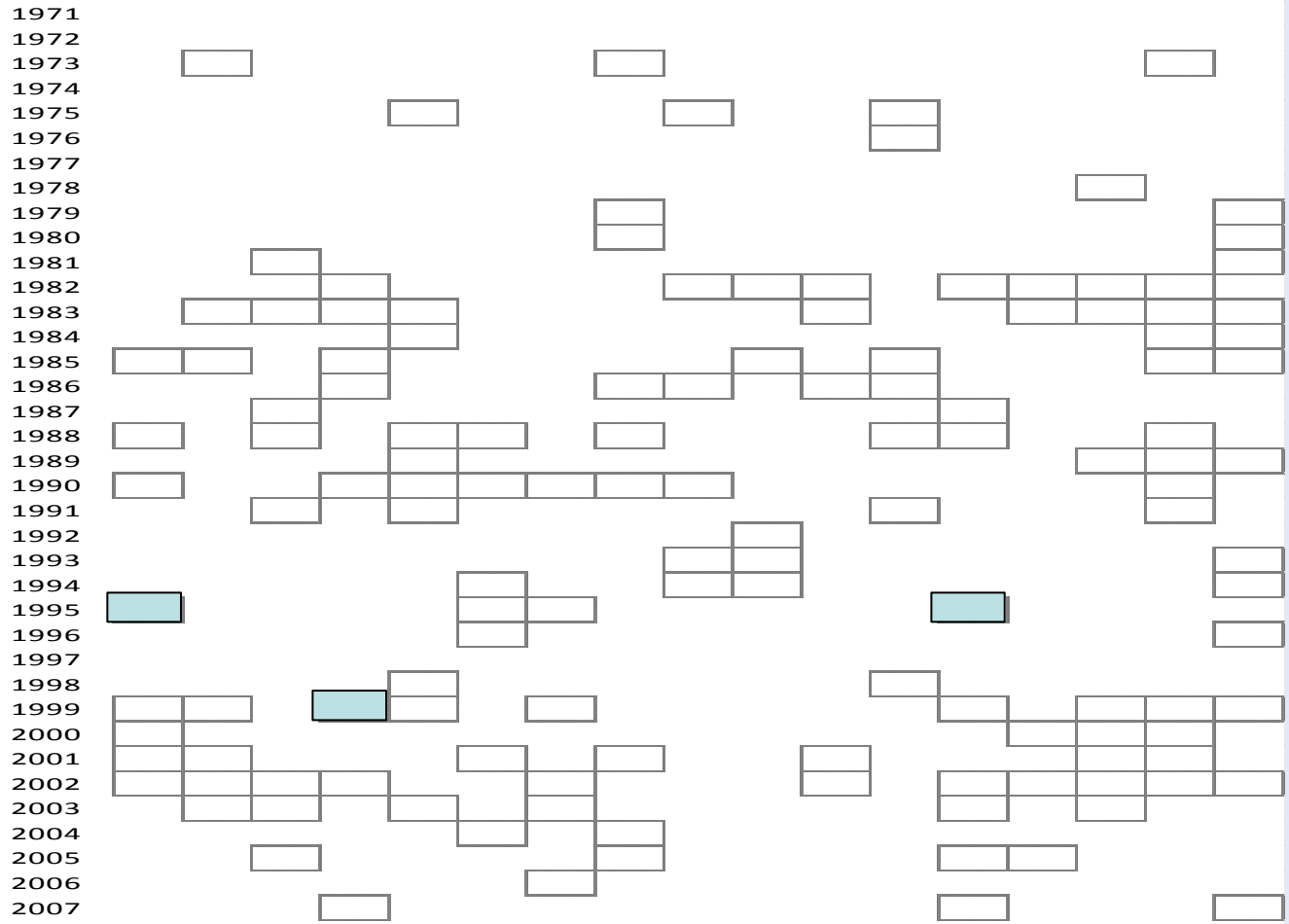
    improvement means positive variation
  - ii. real currency weakening (or nominal)

    weakening means above average variation; actually, market pressure indicator
  - iii. economic recession (or bellow trend growth)
- All the same (bank, debt, crash, flight) for our purposes
- No direct evidence of binding constraint

Crisis Identification

In the weaker, most inclusive sense

Figure 1-a



Data

- Return; (IFS and Lane and Milesi-Ferretti, 2007)
  - Return(t) = [totliab(t) - financialAccountFlow(t) + incomeDebitFlow(t))]/totaliab(t-1)
  - Indeed:

$$Return_t = [P_tB_t - P_t(B_t-B_{t-1}) + D_tB_{t-1}] / P_{t-1}B_{t-1}$$

- Conditioning variables
  - Net foreign liabilities
  - International risk aversion (tedspread)
  - International reserves
  - Overvaluation indicator
    - moving average or panel cointegration

Early Warning Panel Logit

Robust results across crisis definition and country groups

Table 1. Early Warning Panel Logit

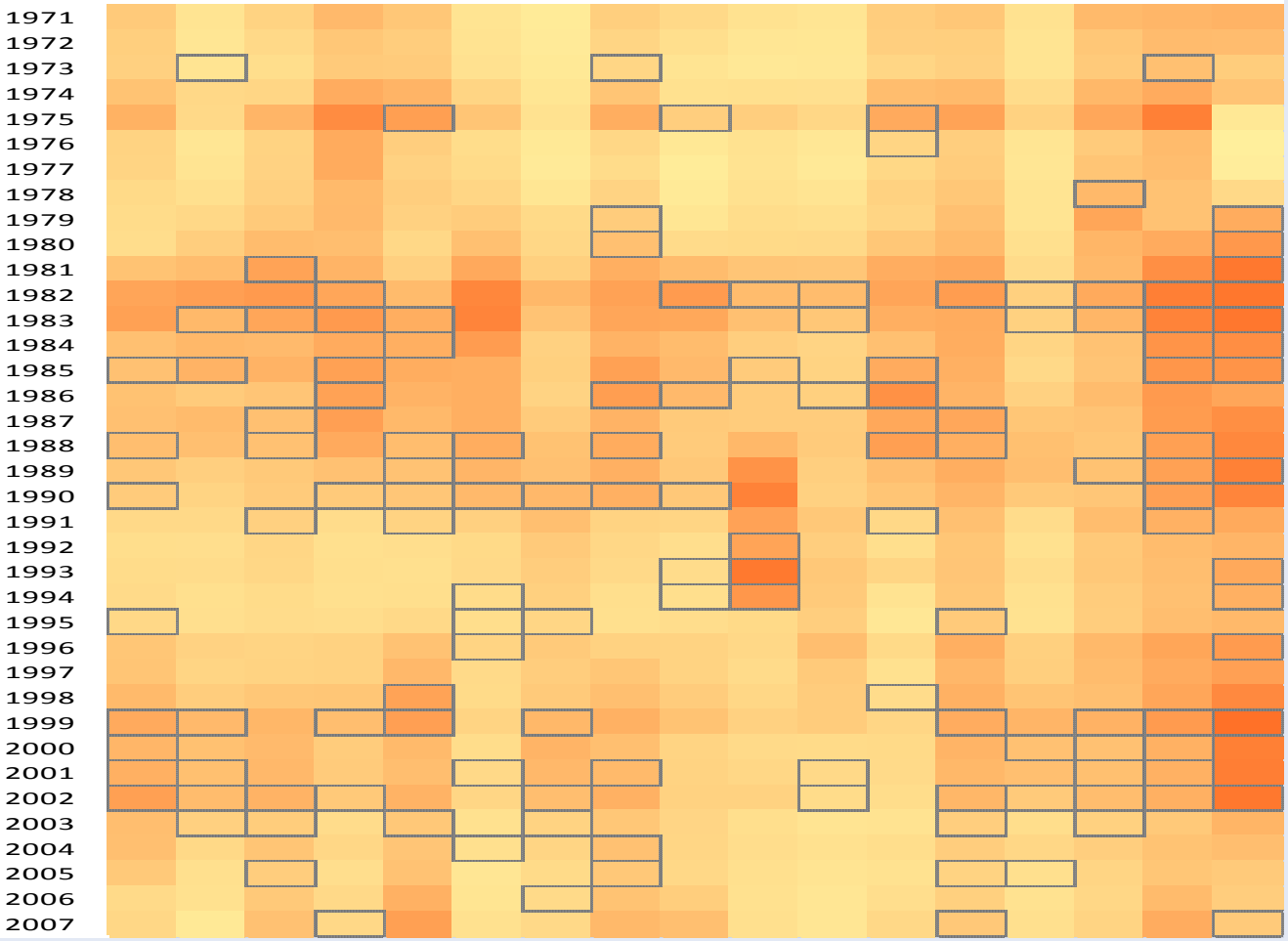
y (subsample)	Crisis	Crisis	Crisis#	Crisis#	Crisis (L)	Crisis (L)	Crisis (S)	Crisis (S)
tedspdlag	0,346 **	0,330 **	0,505 ***	0,501 ***	0,357 *	0,416 *	0,308 .	0,269 *
	(0,120)	(0,114)	(0,137)	(0,142)	(0,163)	(0,162)	(0,175)	(0,164)
divlag	0,023 ***	0,017 **			0,030 *	0,018	0,022 **	0,017 *
	(0,006)	(0,006)			(0,015)	(0,014)	(0,007)	(0,007)
reservasdivlag	-0,025 *	-0,037 **	-0,025 *	-0,031 *	-0,037 *	-0,050 *	-0,011	-0,023
	(0,012)	(0,014)	(0,012)	(0,012)	(0,017)	(0,022)	(0,020)	(0,020)
sobrevalag	0,582 ***		0,646 ***		0,974 ***		0,369 *	
	(0,128)		(0,146)		(0,251)		(0,151)	
sobrevalagcoint		0,128 *		0,1575 *		0,1057		0,1431 *
		(0,057)		(0,063)		(0,097)		(0,073)
Fixed Effects	yes	yes	no	no	yes	yes	yes	yes
N*T	17*35	17*37	17*28-35	17*28-35	7*35	7*37	10*35	10*37
	595	629	538	538	245	259	350	370
Heteroscedastic (LM)	0,241	0,552	0,267	0,118	0,259	0,047	0,487	0,234
Fixed Effects (LR)	0,001	0,005	0,359	0,343	0,013	0,042	0,171	0,065
Poolability (LR)	0,230	0,656	0,100	0,150	0,419	0,723	0,219	0,393
Hosmer-Lemeshow	0,368	0,648	0,284	0,046	0,092	0,649	0,083	0,136

Notes: (i) The first LM2 tests follow Davidson and Mackinnon (2007). To improve power, we report lowest p-value accross alternatives. A rejection of the homogeneity null occurs along the tedspread covariate for Crisis (L); but consistency seems unaffected. (ii) HAC robust standard errors reported in parenthesis

Crisis Heat Map

In the weaker sense; overvaluation obtained with cointegration

Figure 2-b Heat-map (crisis, foward looking)



Amplification Effects

Fixed Effects Instrumental Variables Estimator

Table 2. Amplification Effects Panel Regression

Dep: Fluxocc	(1)	(2)	(3)	(4)	(5)
crescdt	0,317 **	0,413 ***	0,284 **	0,857 **	0,955 **
	(0,097)	(0,081)	(0,096)	(0,206)	(0,191)
crescdt*divstdlag	0,210 ***	0,210 ***	0,222 **		
	(0,063)	(0,058)	(0,076)		
crescdt*sobrevalag	0,192 .		0,189 .	0,253 *	
	(0,105)		(0,110)	(0,120)	
crescdt*sobrevalagcoint		0,018			0,113 *
		(0,017)			(0,048)
crescdt*reservaslag			0,003	-0,046 **	-0,055 **
			(0,010)	(0,016)	(0,021)
Model	Pooled	Pooled	Pooled	Fixed-IV	Fixed-IV
N*T	17*5-13	17*5-13	17*5-13	17*5-13	17*5-13
	127	127	127	127	127
Fixed Effects (LR)	0,289	0,459	0,297	0,013	0,005
Fixed Effects Slope (LR)	0,289	0,233	0,289	0,156	
Hausmann (re vs fe)	0,198	-	0,247	0,880	0,983
Wooldridge (no vs re/ac)	0,316	0,461	0,329	0,170	0,182
Adjusted-R2	0,249	0,243	0,243	(0,187) 0,468	(0,168) 0,424

Notes: (i) Sample includes only crisis years; (ii) HC robust standard errors in parethesis; (iii) IV estimator used divstdlag and tedspreadlag as instruments

Crisis Severity

Fixed Effects Estimator

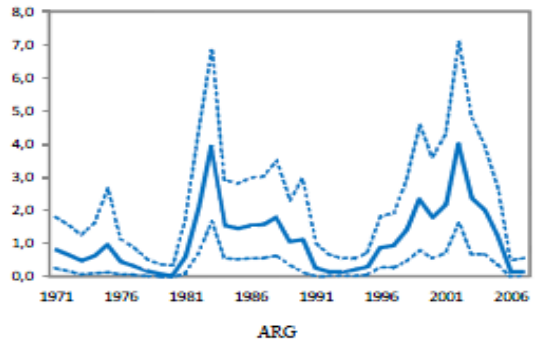
Table 3. Crisis Severity Panel Regression

Dep: return*crescdt	(1)	(2)	(3)
reservaslag	0,176 **	0,176 **	0,075 *
	(0,052)	(0,052)	(0,030)
tedspreadlag	-0,831 **	-0,842 **	-0,842 *
	(0,312)	(0,314)	(0,336)
sobrevalag	-1,093 *		-0,883 *
	(0,461)		-0,437
sobrevalagcoint		-0,152	
		(0,125)	
liabstrlag			0,009 .
			(0,005)
Model	Fixed	Fixed	Pooled
N*T	17*5-17	17*5-17	17*5-17
	129	129	129
Fixed Effects (LR)	0,092	0,142	0,124
Hausmann (re vs fe)	0,078	0,172	0,281
Wooldridge (no vs re)	0,306	0,393	0,292
Adjusted-R2	0,545	0,541	0,513

Notes: (i) Sample includes only crisis years; (ii) HC robust standard error

Optimal Taxes

Bootstrapped 95% confidence intervals



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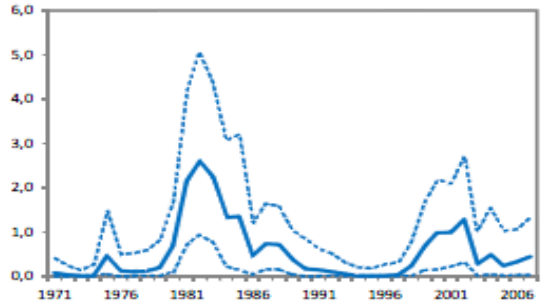

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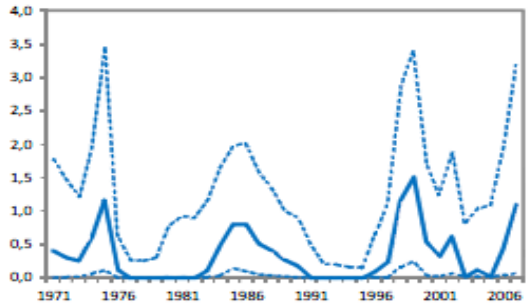

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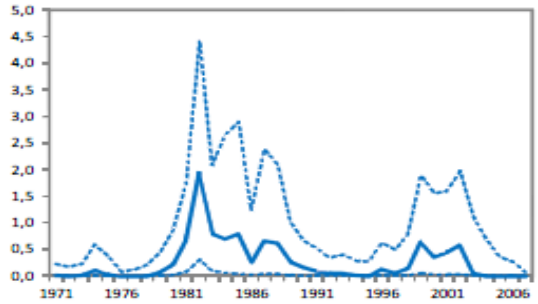

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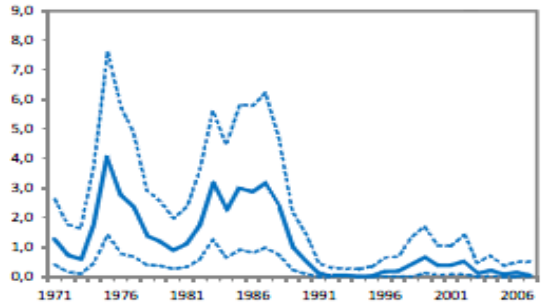

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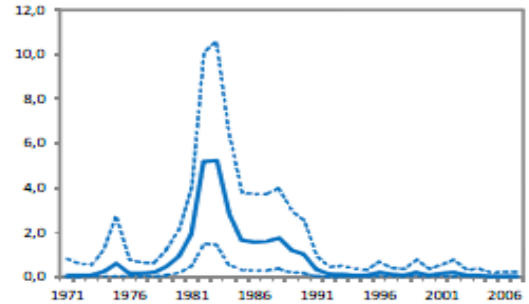

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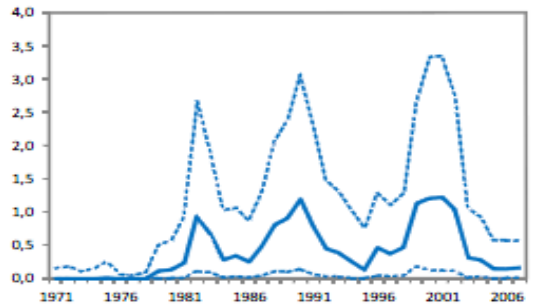

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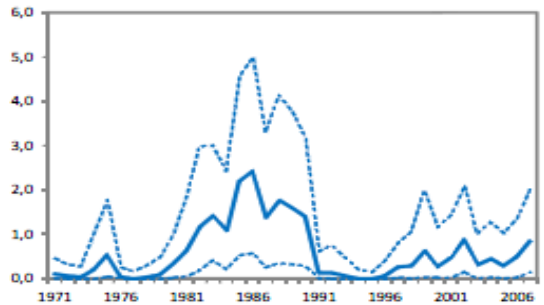

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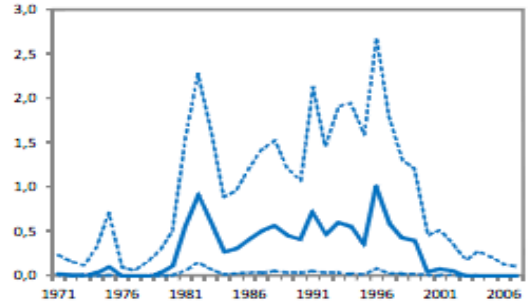
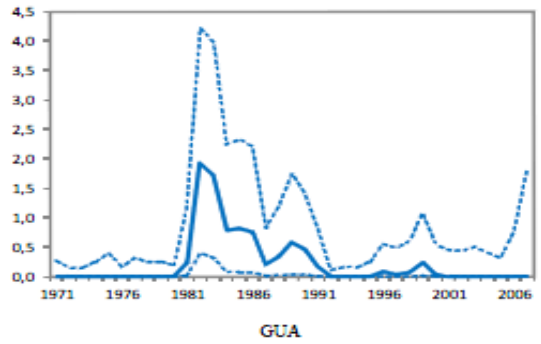


HON

Optimal Taxes

Bootstrapped 95% confidence intervals



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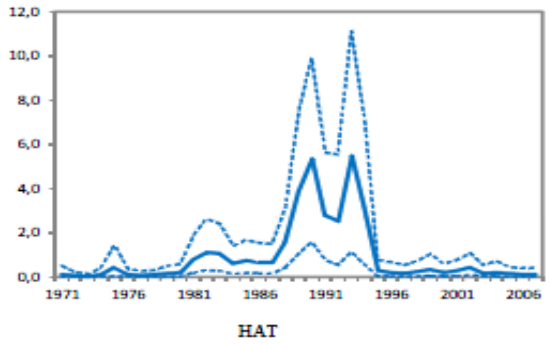

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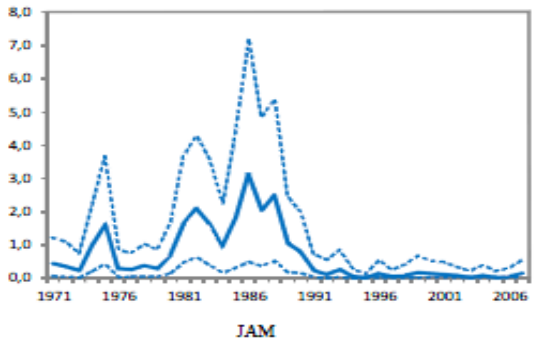
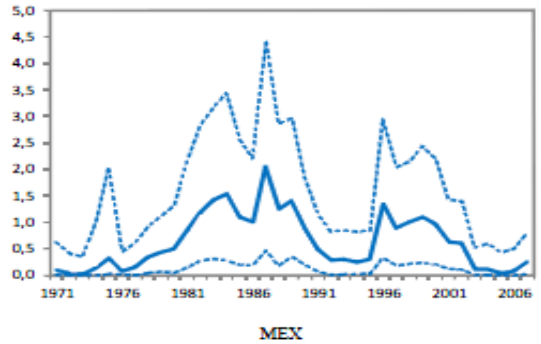
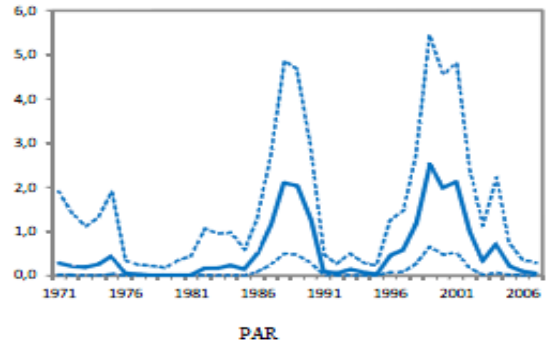


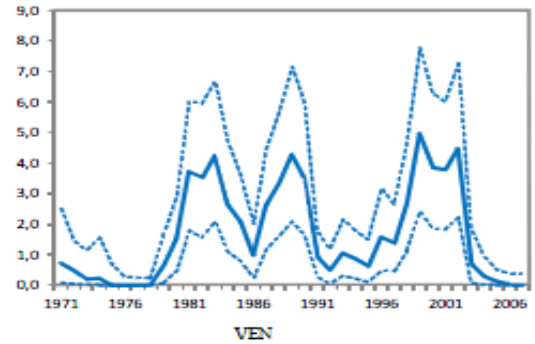
JAM



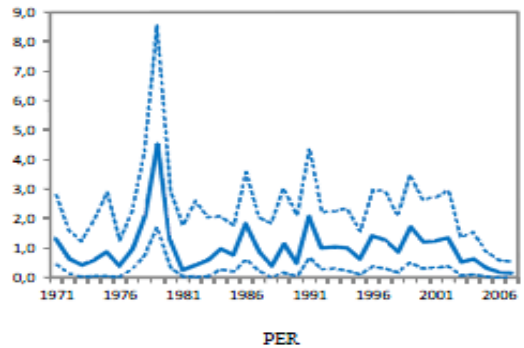
MEX



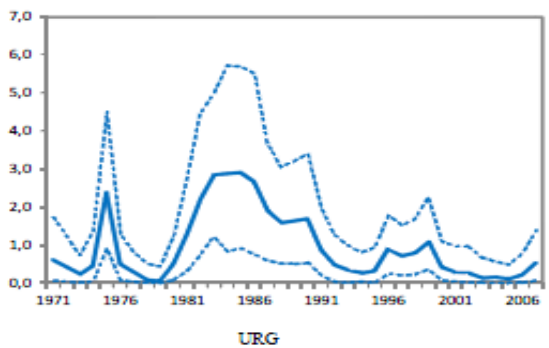
PAR



VEN



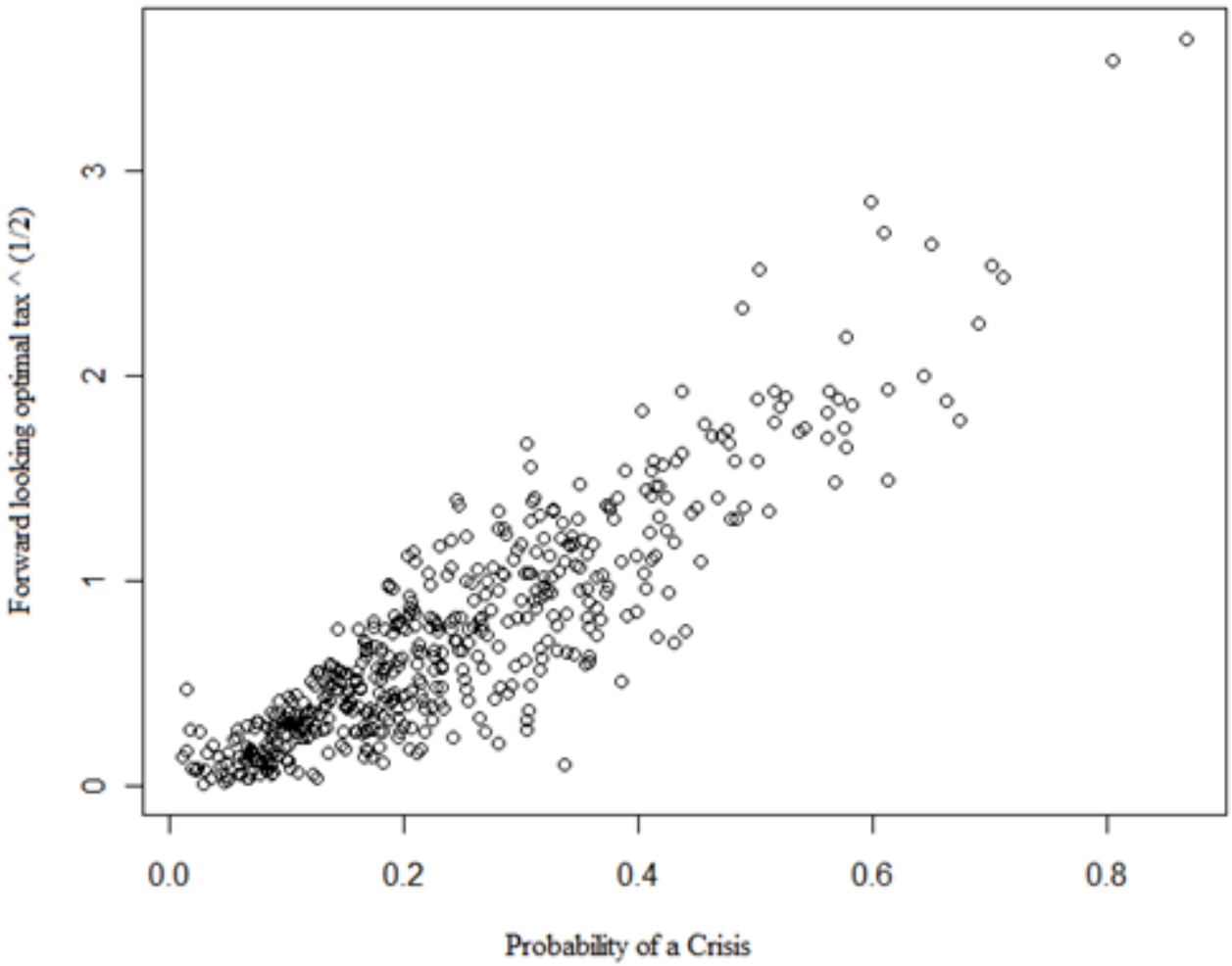
PER



URG

Rule of Thumb for the Optimal Tax:

Proportional to the square of the likelihood of a crisis**



** proportionality factor is the square of the risk aversion coefficient

Further Work

- More specific events (bank, debt, crash, flight)
  - Improve precision of crisis likelihood, severity and amplification estimates
  - Better confidence intervals
  - Different conditioning variables or channels
- Non-linear time series models (markov switching)
  - Specific countries data sets and particularities
  - Better model of crisis duration and contagion
- Financial development and relative costs
  - Include capital controls (amplification regression)

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Thank you

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