2nd PBSS COLLOQUIUM
Helsinki, FINLAND 21-23 May 2007

AN ACTUARIAL BALANCE SHEET FOR PAY-AS-YOU-GO FINANCE: SOLVENCY INDICATORS FOR SPAIN

Carmen BOADO-PENAS, University of the Basque Country (Spain)

Salvador VALDÉS-PRIETO, PUC University (Chile)

Carlos VIDAL-MELIÁ, University of Valencia (Spain)

AIM of this paper

- ✓ To show the usefulness of the actuarial balance sheet as an indicator of solvency, sustainability or financial solidity of any pay-as-you-go financed pension system.
- ✓ To offer the first estimate, based on official data, of the actuarial balance sheet of the Spanish contributory pension system.

STRUCTURE of this paper

1) Introduction.

2) Actuarial balance sheet of a pay-as-you-go pension system.
- Overview on the **Contribution Asset**
- Overview on the **Hidden Asset**

3) The Swedish experience with the actuarial balance sheet.

4) Balance sheet of the Spanish pension system.

5) Concluding remarks.

6) Bibliography.

7) Appendixes (7.1.-Contribution Asset. 7.2.-Hidden Asset, 7.3.-Sensitivity Analysis, 7.4.-Spanish Data).

1.- Introduction.

- ✓ Three important issues in pension finance:
  1) Transparency in the management of the finances of public systems.
  2) Immunising the pay-as-you-go system against the political risk.
  3) To gain credibility among participants.
- ✓ The actuarial balance sheet provides response to these three issues.
- ✓ The actuarial balance sheet may also help neutralise and/or minimise populism with regard to pensions.
- ✓ The actuarial balance sheet has been developed and applied by Sweden since 2001. In USA, BOT (2006) has been compiling elements to build an actuarial balance sheet since 1965.

2.- Actuarial balance sheet of a pay-as-you-go system.

- **Main entries on the balance sheet of a pay-as-you-go system.**

ASSETS	LIABILITIES
Financial and Real Assets	Liability to Pensioners
Contribution Asset/ Hidden Asset	Liability to Contributors
Accumulated Deficit	Accumulated Surplus
TOTAL ASSETS	**TOTAL LIABILITIES**

Financial and Real Assets + Contribution Asset or Hidden Asset $\geq$ Liability to Pensioners + Liability to contributors } Solvent

Financial and Real Assets + Contribution Asset or Hidden Asset $<$ Liability to Pensioners + Liability to contributors } Partially solvent

2.- Actuarial balance sheet of a pay-as-you-go system.

- The presence of the Contribution/Hidden Asset in the balance sheet counters those who discredit pure and partial pay-as-you-go finance by claiming that it is always "bankrupt" or insolvent.

- These concepts are different.

Contribution Asset

Settergren (2001, 2003)
Settergren & Mikula (2005)

Maximum liability that can be financed in that steady state by the current contribution rate without supplements from the sponsor.

Hidden Asset

Lüdecke (1988), Sinn (1990), Valdés-Prieto (2002)…

Present discounted value of the hidden taxes and hidden subsidies that will be applied by the pension system to its participants in the future, under legislated parameters.

2.- Actuarial balance sheet of a pay-as-you-go system.

Overview on the Contribution Asset.

- **The Contribution Asset is derived from linking the assets and liabilities of the pension system.**

$$Liabilities = Assets \Rightarrow \overbrace{V_t = f(\text{benefit parameters}, \gamma, g, d) \cdot C_t}^{\text{Contribution Asset (CA)}}$$

$$V_t = CA_t = \underbrace{TD}_{\text{Turnover Duration}} \cdot C_t \Rightarrow TD = \frac{V_t}{C_t}$$

$$d = g, \gamma = 0 \Rightarrow TD = (pt_r + pt_c) \Rightarrow TD = A_r - A_c$$

Weighted average age of pensioners

Weighted average age of contributors

Pay-out duration (appendix 1)

Pay-in duration (appendix 1)

V_t : Accrued liabilities at date t

C_t: Contribution revenue in year t

γ : Fertility-driven population growth rate

g : Growth rate of average covered earnings in real terms

d : Discount rate

3.- Balance sheet of the Swedish pension system.

➢Main assumptions:

✓Both assets and liabilities are valued on the basis of verifiable cross-section facts, i.e. no projections are made.

✓The Liability to Contributors is calculated as the notional capital accumulated in the participants' accounts.

✓The Liability to Pensioners is the "nominal" value of benefits expected to be paid, and it is calculated by multiplying the annual pension by the economic annuity divisor for each cohort.

✓The system's solvency does not depend on the amount of the assets and liabilities separately, but on the relation between them via the solvency ratio. → Total assets/total liabilities

✓If the solvency ratio is less than one, the Swedish system imposes an "automatic balance mechanism", that modifies the notional interest rate credited and the indexation rate for pensions.

3.- Balance sheet of the Swedish pension system.

Year	2005	2004	2003	2002	2001
ASSETS					
Financial Asset	28.8	25.1	23.5	20.6	24.7
Contribution Asset	214.0	217.9	222.2	223.2	222.2
Total Assets	242.8	243.0	245.7	243.7	246.9
LIABILITIES					
Liability to Contributors	172.6	174.3	175.4	175.3	172.3
Liability to Pensioners (241.8)	69.2	68.3	67.9	66.3	65.1
Accumulated surplus (1)	0.3	2.2	2.1	9.2	9.5
"Losses or benefits"	0.7	-1.9	0.3	-7.0	
Total Liabilities	242.8	243.0	245.7	243.7	246.9
FUNDING AND SOLVENCY INDICATORS					
Solvency ratio (Total Assets/Liabilities)	1.0044	1.0014	1.0097	1.0090	1.0402
Degree of funding (Financial Asset/Liabilities)	11.90%	10.35%	9.64%	8.51%	10.40%
Liabilities to Contributors/Liabilities	71.4%	71.8%	72.1%	72.6%	72.6%

% of GPD. Source: Försäkringskassan (2006), (2005), (2004), (2003), (2002) and authors

4.- Balance sheet of the Spanish pension system.

- Main assumptions:

✓ Information relating to the commitments acquired with current workers and pensioners for the retirement contingency.

✓ Social security regimes considered: general, agrarian workers, self-employed workers, coal mining, domestic employees, sea workers and SOVI.

✓ The philosophy used to compile the balance sheet in Sweden will be followed as far as possible when valuing the Spanish system's assets and liabilities.

✓ Spanish current benefit formula: constant pensions, pension base is calculated by taking into account the 15 years before retirement.

4.- Balance sheet of the Spanish pension system.

Year	2005	2004	2003	2002	2001
ASSETS					
Financial Asset	3.00	2.30	1.54	0.85	0.36
Contribution Asset (191.74)	188.74	188.74	194.18	196.21	203.75
Accumulated Deficit	101.39	96.16	94.56	87.29	93.51
"Losses for the period" (108.71)	7.32	13.12	8.67	14.19	0.00
Total Assets	300.45	300.32	298.95	298.53	297.62
LIABILITIES					
Liability to Pensioners	60.82	60.75	61.62	63.31	62.10
Liability to Contributors	239.63	239.57	237.33	235.22	235.52
Total Liabilities	300.45	300.32	298.95	298.53	297.62
FUNDING AND SOLVENCY INDICATORS					
Solvency ratio	0.638	0.636	0.655	0.660	0.686
Degree of funding	1.00%	0.77%	0.51%	0.28%	0.12%
Liabilities to Contrib./Liabilities	79.8%	79.8%	79.4%	78.8%	79.1%

% of GDP. Source: Authors

4.- Balance sheet of the Spanish pension system.

- Different values of "d" considered.
- Comparation to Sweden results.
- Results for different Spanish regimes.
- Causes of insolvency in the Spanish case.

4.- Balance sheet of the Spanish pension system. Different values of "d".

ASSETS			
	d=0%	d=1.5%	d=3%
Financial Asset	3.00	3.00	3.00
Contribution Asset	188.74	121.57	77.70
Accumulated Deficit	101.39	69.15	46.21
"Losses for the period"	7.32	2.90	1.64
Total Assets	300.45	196.62	128.45
LIABILITIES			
Liability to Pensioners	60.82	53.41	47.84
Liability to Contributors	239.63	143.21	80.61
Total Liabilities	300.45	196.62	128.45
FUNDING AND SOLVENCY INDICATORS			
Solvency ratio	0.638	0.634	0.628
Degree of funding	1.00%	1.53%	2.34%
Liabilities to Contrib./Liabilities	79.8%	72.8%	64.0%

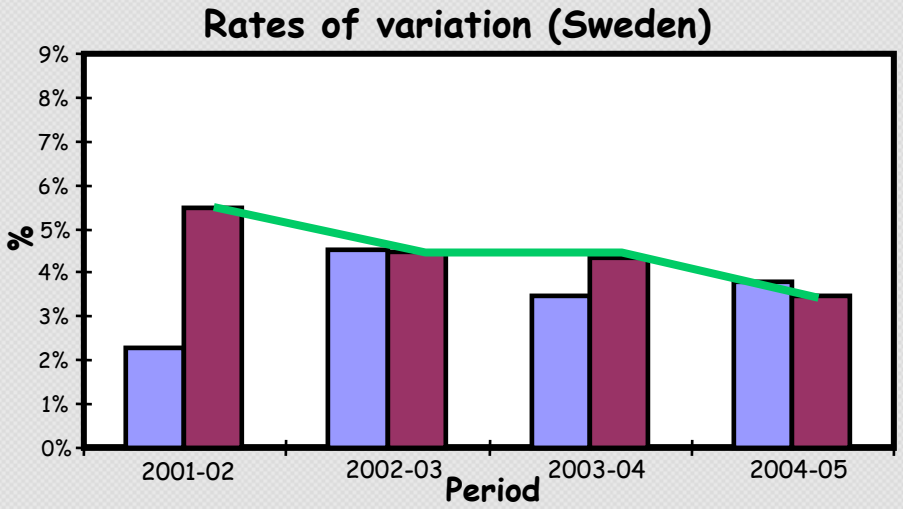
% of GPD. Year 2005. Source: Authors

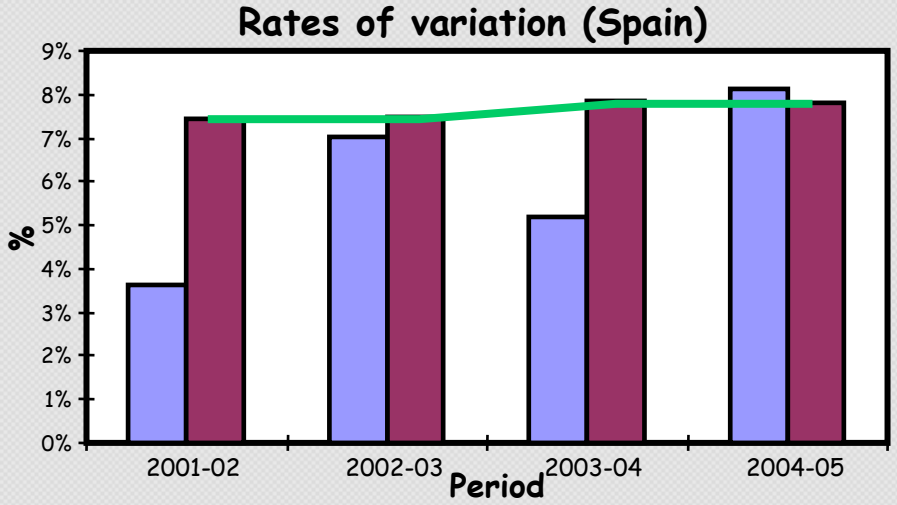
4.- Balance sheet of the Spanish pension system. Comparation to Swedish results.

ASSETS		
	Spain	Sweden
Financial Asset	3.00	28.8
Contribution Asset	188.74	214.0
Accumulated Deficit	101.39	
"Losses for the period"	7.32	
Total Assets	300.45	242.8
LIABILITIES		
Liability to Pensioners	60.82	69.2
Liability to Contributors	239.63	172.6
Accumulated surplus		0.3
"Benefits for the period"		0.7
Total Liabilities	300.45	242.8
FUNDING AND SOLVENCY INDICATORS		
Solvency ratio	0.638	1.0044
Degree of funding	1.00%	11.90%
Liabilities to Contrib./Liabilities	79.8%	71.4%

% of GPD. Year 2005. Source: Authors

4.- Balance sheet of the Spanish pension system. Comparation to Sweden



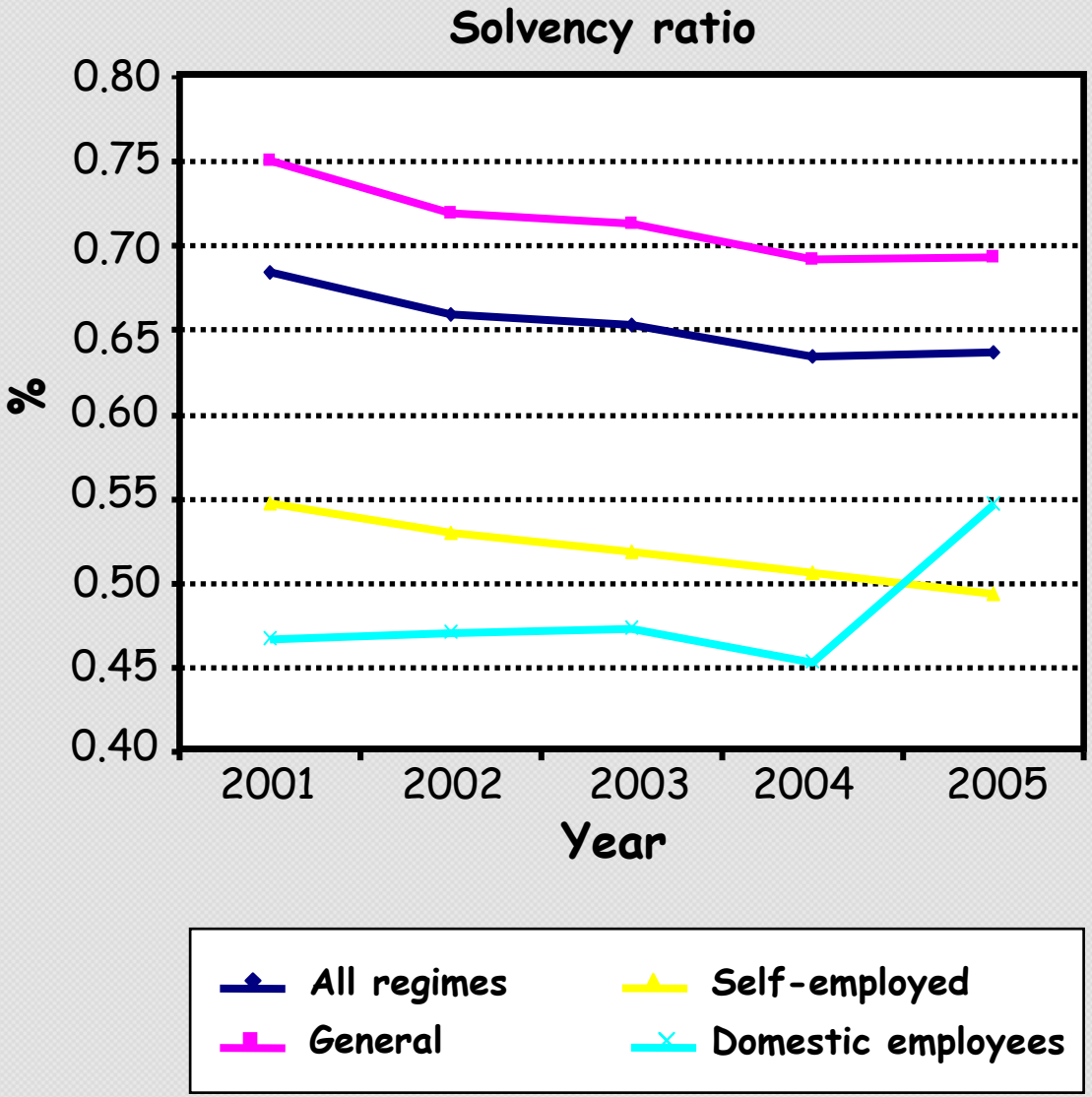


4.- Balance sheet of the Spanish pension system. Results for different Spanish regimes.

Regime	All regimes	General 80%	Self-employed	Domestic employees
ASSETS				
Financial Asset	3.00	2.55	0.31	0.03
Contribution Asset	188.74	160.40	19.26	1.90
Accumulated Deficit	108.71	72.55	20.36	1.59
Total Assets	300.45	235.50	39.92	3.52
LIABILITIES				
Liability to Pensioners	60.82	43.14	5.39	1.20
Liability to Contributors	239.63	192.36	34.53	2.32
Total Liabilities	300.45	235.50	39.92	3.52
SOLVENCY INDICATOR				
Solvency ratio	**0.638**	**0.692**	**0.490**	**0.549**

% of GDP. Year: 2005. Source: Authors

4.- Balance sheet of the Spanish pension system. Results for different Spanish regimes.



4.- Balance sheet of the Spanish pension system. Causes of insolvency in the Spanish case.

✓ Actuarial imbalance: the relation between the expected contributions and expected benefits "yields" too high an implicit IRR for contributor. See Monasterio *et al.* (1996), Vidal-Meliá & Domínguez-Fabián (2006) amongst others.

✓ The cost of selling (commitments) > the selling price (contributions).
Paradox: "The more sold, the more positive the net cash flow observed, but greater the degree of insolvency of the system as a whole".

✓In the Spanish defined-benefit design, the current evolution will continue until new legislation is adopted.

↓

Swedish system has the automatic balance mechanism

✓ Restoring solvency to the Spanish system would demand a package of far-reaching measures to reduce the speed of growth of the liabilities.

5.- Concluding remarks.

✓The existence of the Contribution Asset shows that there is no basis for the arguments put forward by those who discredit pure and partial pay-as-you-go finance systems by saying that they are always "bankrupt" or insolvent.

✓The balance sheet for the Spanish contributory retirement pension system as of 2005 shows a weak position of solvency (solvency ratio equal to 0.638, the assets deficit was 36.2 % of liabilities).

✓The Spanish system shows signs of a structural actuarial imbalance: the relation between the expected contributions and pension benefits "yields" too high an implicit IRR for the average participant.

✓The absence of a actuarial balance, in the case for Spain, produces a "MIRAGE EFFECT"; by hiding the presence of a capital deficit, it relativises future cash deficits because there is still time before they occur and still time meanwhile for "something to save the system".

AN ACTUARIAL BALANCE SHEET FOR PAY-AS-YOU-GO FINANCE: SOLVENCY INDICATORS FOR SPAIN

KIITOS

END