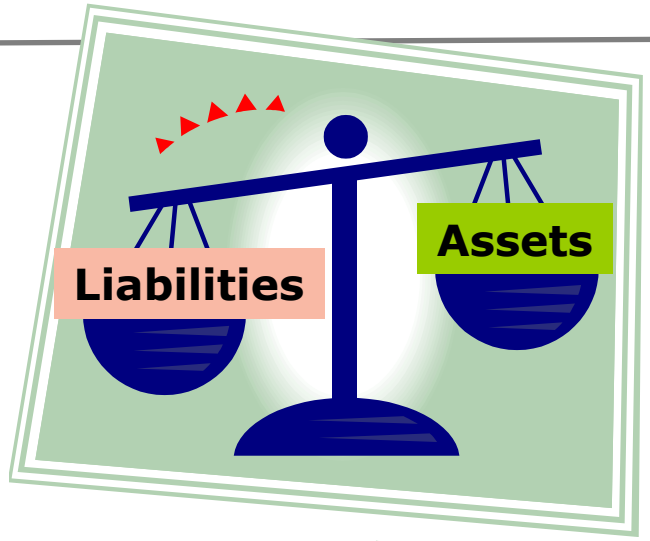
Notes on Considering the Hidden Asset or Contribution Asset to Compile the Actuarial Balance for the Pay-As-You-Go Pension Systems.

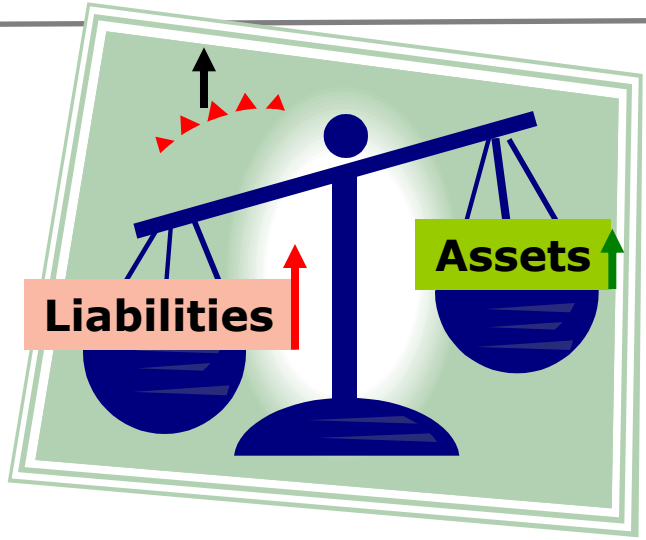
by

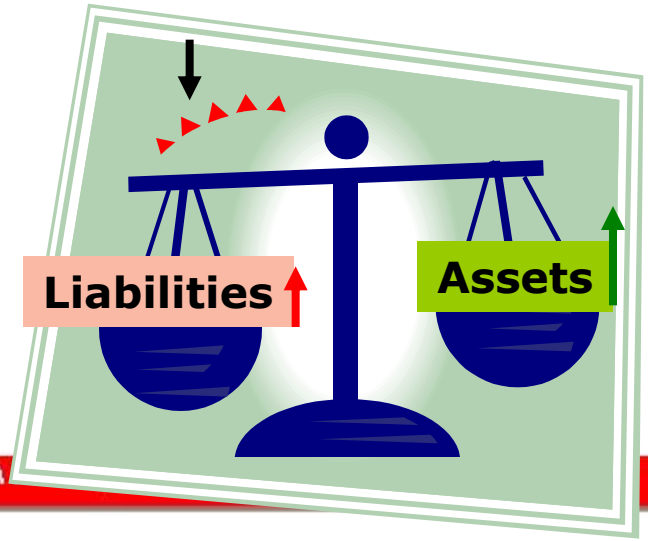
Carlos Vidal-Meliá

María del Carmen Boado-Penas


MOTIVATION


Liabilities
Assets

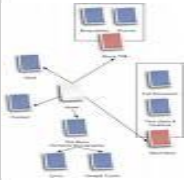

Liabilities
Assets


Liabilities
Assets

AIM of this paper

To determine the connection between "Contribution Asset" (CA) and "Hidden Asset" (HA).

To seek to find out whether using either of these to build the actuarial balance in pay-as-you-go pension systems will provide a reliable solvency indicator.



STRUCTURE of this paper

1.- Introduction

Growing social demand for transparency in the financial management of public system

Advantages of immunising pay-as-you-go pension systems against some political risk

Desire to gain credibility among participants and to face up to reputational risk

New management tools

- Notional Defined Contribution Accounts (NDC's)
- Actuarial Balance (AB)
- Automatic Balance Mechanism (ABM's)

1.- Introduction

Actuarial Balance

It measures the difference in present value, discounted by the projected yield, between spending on pensions and income from contributions, taking into account that the level of financial reserves at the end of the time horizon reaches a magnitude of one-year's expenditure. (1941)

Actuarial Balance sheet

Financial statement listing the pension system's obligations towards contributors and pensioners at a particular date, with the amounts of various assets which back up these commitments. (2001)

1.- Introduction

ASSETS	LIABILITIES
Financial Assets	Liability to Pensioners
Contribution Asset/ Hidden Asset	Liability to Contributors
Accumulated Deficit	Accumulated Surplus
Actuarial losses	Actuarial profits
TOTAL ASSETS	TOTAL LIABILITIES

Financial Assets + Contribution Asset

$\geq$ $<$

Liability to Pensioners + Liability to contributors

Solvent

Partially solvent

2.- CA versus HA

Contribution Asset

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

It can be interpreted intuitively as the maximum level of liabilities that could be financed by the existing contribution rate, if the conditions prevailing at the time of valuation remain constant.

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.- CA versus HA

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

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

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

$$d = G \Rightarrow TD = (pt_r + pt_c) \Rightarrow TD = (A_r - \bar{R}) + (\bar{R} - A_c)$$

Weighted average age of pensioners

Weighted average age of contributors

Pay-out duration

Pay-in duration

Weighted average retirement age

V_t : Accrued liabilities at date t

C_t : Contribution revenue in year t

G: Growth rate of the covered wage bill;

$G = (1+\gamma)(1+g) - 1$

γ : Fertility-driven population growth rate

g : Growth rate of covered earnings.

d : Discount rate

λ : Growth rate of pensions

2.- CA versus HA

$$HA_t \equiv \sum_{i=0}^{\infty}\left[\sum_{k=0}^{A-1}\theta^{*}\cdot y_{(x_e+k,\,t)}\cdot N_{(x_e+k,\,t)}\right]\frac{(1+G)^{i}}{(1+r)^{i}} = \theta^{*}\sum_{k=0}^{A-1} y_{(x_e+k,\,t)}\cdot N_{(x_e+k,\,t)}\left[\frac{1+r}{r-G}\right]$$

$(\theta - \theta_f)$: **Differences in contribution rates**

G Growth rate of the covered wage bill

r : Real rate of interest in the financial markets

θ : Contribution rate

θ_f : Actuarially fair rate calculated with r

$y(t)$: Pensionable earnings in t

$N(t)$: Number of working participants in period t

2.- CA versus HA

- In the steady state if r > G:

$$(CA_t = V_t^{T(d=G)}) > (HA_t = V_t^{T(r>G)})$$

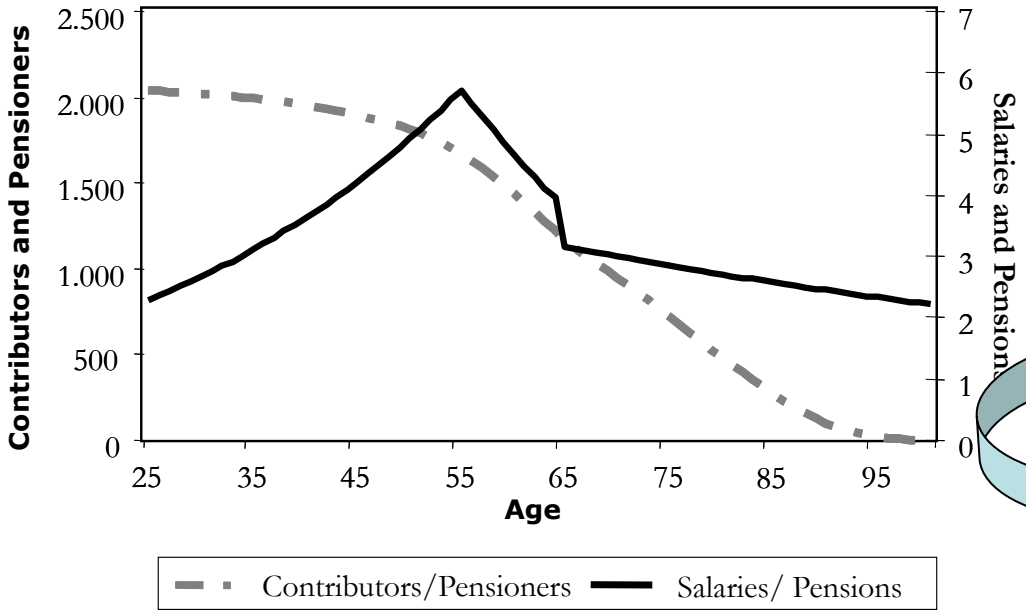
$$\lim_{(r-G)\to 0^+} HA_t = V_t^{T(r=G)} = V_t^{T(d=G)} = CA_t$$

2.- CA versus HA

- The **Hidden Asset (HA)**, in contrast, despite being applied to the PAYG system, must use the **rate** of discount observed in the **financial markets**, so it can be determined in **dynamically efficient economies (r > G).**

- In practice, Robalino and Bogomolova (2006), HA **tends to be negative** (liability?) in most DB-PAYG systems!!!!

3.- The use of CA and HA as solvency indicators



Assumptions:

g = 1%; γ = 2% ; λ =0%
Pensions: 80% Regulation base (whole working life)

Balanced Contribution rate: 16.51%,
TD: 27.59 years

3.- The use of CA and HA as solvency indicators

Balanced Pension System:

ASSETS			LIABILITIES		
CA	1,238,135	100%	Liabilities to contributors	849,909.30	66.24%
Accumulated deficit	0	0%	Liabilities to pensioners	433,225.80	33.76%
Total assets	1,238,135	100%	Total Liabilities	1,238,135.1	100%

G=(1.01)(1.02)-1=0.0302

ASSETS			LIABILITIES		
HA	938,329.77	100%	Liabilities to contributors	530,444.15	56.53%
Accumulated deficit	0	0%	Liabilities to pensioners	407,885.62	43.47%
Total assets	938,329.77	100%	Total Liabilities	938,329.77	100%

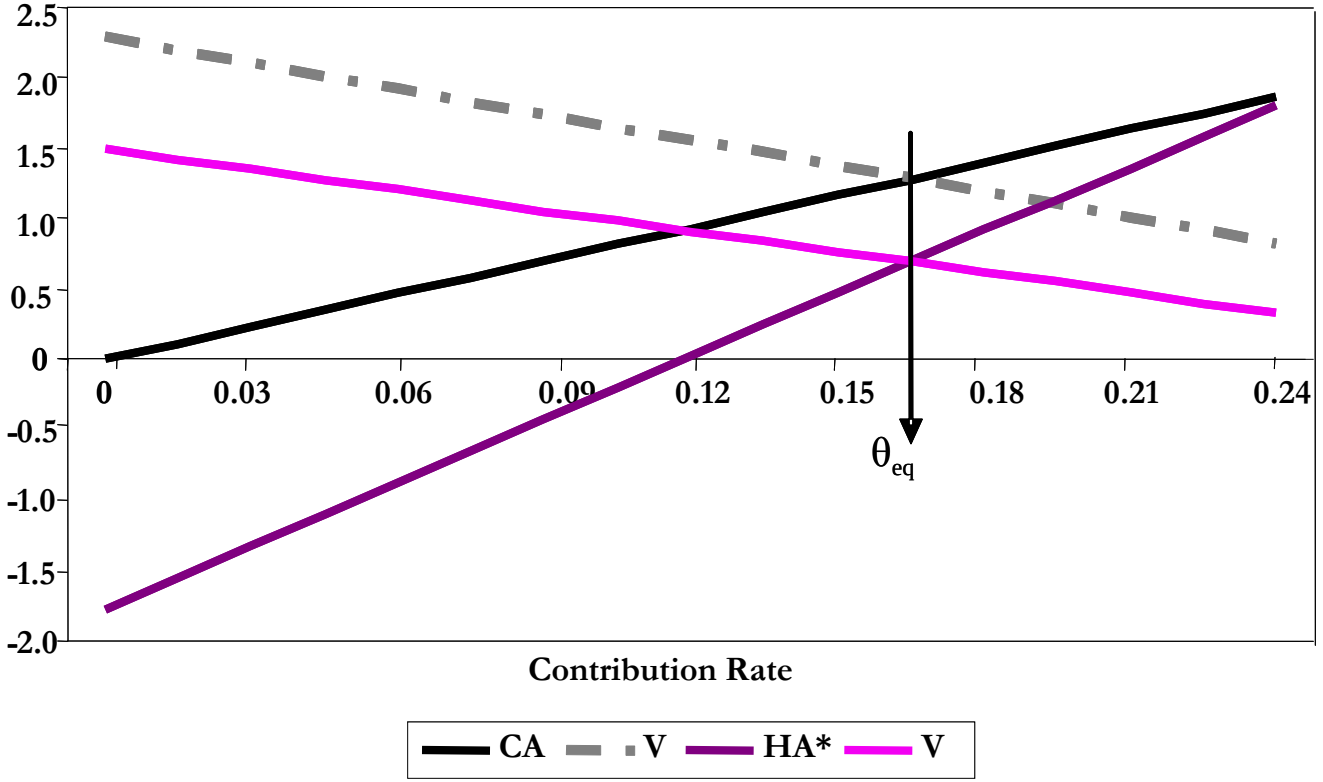
G=0.0302; r=0.04

⚠ **Remember:** $\lim_{(r-G)\to 0^+} HA_t = V_t^{T(r=G)} = V_t^{T(r=G)} = CA_t$

3.- The use of CA and HA as solvency indicators

Unbalanced Pension System:

Contribution rate $\neq$ Balanced Contribution rate

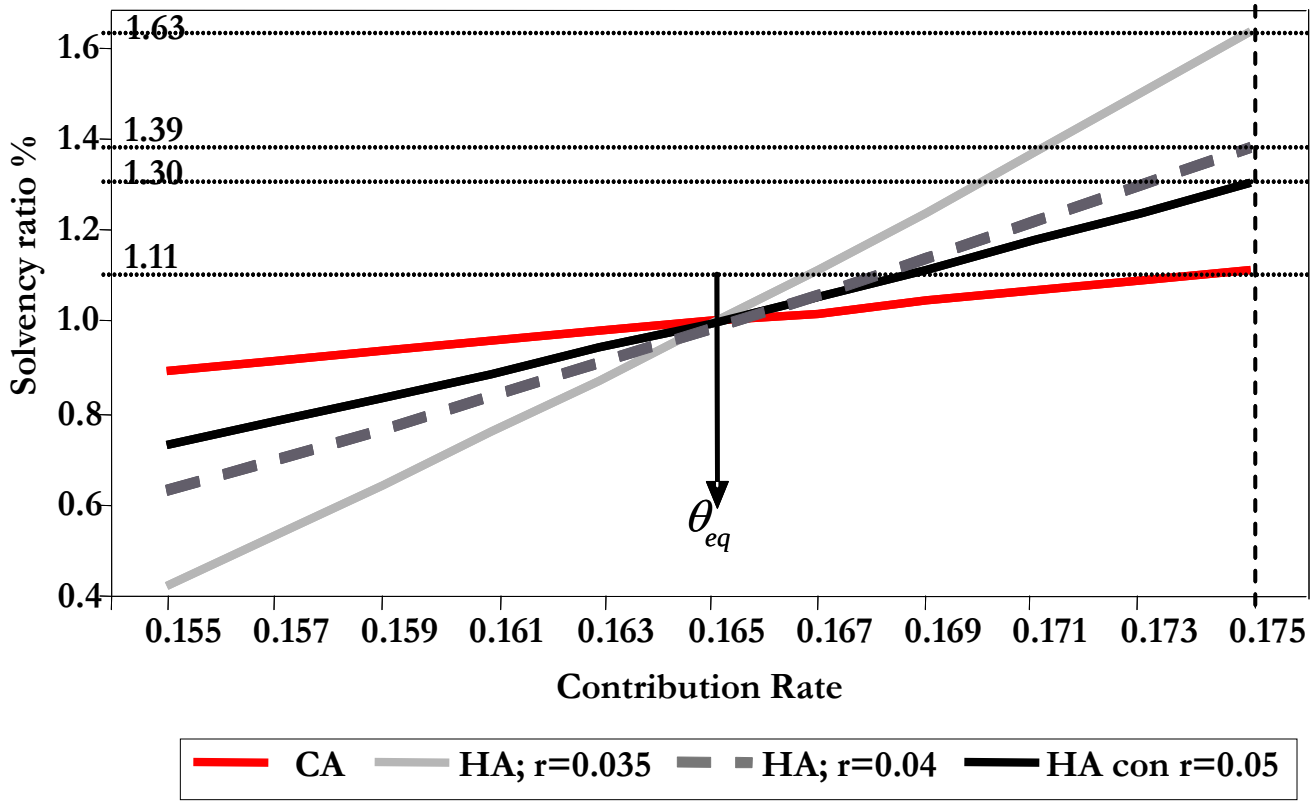


CA versus HA, r=0.05; g=0.01; γ=0.02

3.- The use of CA and HA as solvency indicators

Unbalanced Pension System:

Solvency ratio using CA and HA



4.- Concluding comments

The novel entry on the PAYG balance sheet is the one called the "contribution asset" (Settergren and Mikula 2005 and Boado-Penas et al. 2008). Other researchers question its validity and suggest another indicator as the "hidden asset".

The main theoretical conclusion is that the Contribution and Hidden Asset could coincide if r (real rate of interest) equal to G (the growth rate of the covered wage bill). And, in this case, $\theta_{eq} = \theta = \theta_f$

4.- Concluding comments

- On the applied side, it is better to use the Contribution Asset to calculate the actuarial balance sheet mainly for:
  - ⟹ Financial-actuarial basics based on the pay-as-you-go pension system.
  - ⟹ Simplicity of calculation.
  - ⟹ Clarity in the diagnosis of solvency.

- TD is always equal to the difference between the average age of pensioners and average age of contributions, no matter the value of G chosen.

- Finally the use of the "*negative Hidden Asset*" has more sense when a "US" type actuarial balance is compiled.

Notes on Considering the Hidden Asset or Contribution Asset to Compile the Actuarial Balance for the Pay-As-You-Go Pension Systems.

Thank You !