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# Workshop

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## Financial Indicators of an Automatically Financially Balanced Public Pension Plan

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### 1 Introduction

Public pension plans are probably the largest financial transaction systems that we have. In OECD countries their expenditure ranges from 5 to 15 percent, and their liabilities, as a rough estimate, from 150 to 300 percent of gross domestic product (GDP). For many governments, pension payments are the single largest expenditure. National pension plans also represent one of the most long-term commitments of governments. The size of these systems is of course reflected in their importance to insured citizens. For many, perhaps most, the claim of individuals on the public pension system represents their single largest “asset”.

In spite of the economic importance and long-term commitment of these pension plans, their financial reporting is essentially medieval. The first problem is that reporting is scarce, and that when it exists it is not infrequently of low quality. Here I will deal only with a second problem, which is that financial reporting on pay-as-you-go pension plans is based essentially on single-entry bookkeeping, statements of cash flows and projections of cash flows. The thirteenth-century invention of double-entry bookkeeping which for centuries has been the preferred method for accumulating and presenting financial information in virtually all organisations but governments, has not been applied to national pay-as-you-go pension plans.

The various cash-flow measurements that are used to show the financial status of public pay-as-you-go pension schemes do not effectively answer the questions what *cause*, what *effect*, by what *means*, and at what *rate*. Thus, present financial reporting is weak in essential information. The single most important measure to enhance expert, public and policymaker knowledge of the workings of public pay-as-you-go pension plans would be to introduce double-entry bookkeeping for these systems. A plausible assumption is that only what is mentioned and measured exists in people’s minds. Thus, such improved reporting and knowledge may lead to better policy measures in the future, when present financial imbalances will make it necessary to take corrective action. However this second claim is much more doubtful than the first.

This policy brief presents the double-entry bookkeeping system that has been used for the essentially pay-as-you-go financed Swedish public pension system since 2001. This bookkeeping system was developed for the new pension plan, *inkomstpension*, as an intermediate step to ensure automatic financial stability. The objective of the so-called automatic balance mechanism was to minimise the volatility of the value of the average pension relative to the average income for people of working age, while adhering strictly to a fixed contribution rate, or payroll tax. Admittedly, the double-entry bookkeeping procedure was an unintentional spin-off from the research undertaken to achieve these policy aims.

## 2 Conventional measures of “actuarial balance” in pay-as-you-go pension plans

For this writer, the most familiar measures of the financial status of public pension schemes are the one that was used in Sweden by Riksförsäkringsverket (RFV) prior to 2001 and the central measure presently used by the US Social Security Agency (SSA).

In Sweden RFV was obliged to present an analysis every five years of the financial status of the public pension scheme and, in relation to this analysis, to propose a suitable contribution rate, or payroll tax. The analysis was presented mainly as a projection of buffer-fund development, in terms of fund ratio,<sup>1</sup> assuming a fixed contribution rate and unchanged benefit provisions. Normally financial balance, i.e. a buffer fund that never dropped below a certain level in a specific scenario, would be secured by proposing an upward adjustment of the contribution rate. The range of these projections varied, but prior to 1990 they were never for longer than 50 years.

In several respects the financial analysis of the US Social Security system has been more advanced and systematic than was the case in Sweden. One reason has perhaps been the longer tradition of the large US public pension plan. The US Social Security system was introduced in the 1930's; in Sweden the earnings-related pension plan (ATP) was inaugurated in 1960. The US Social Security Administration (SSA) reports annually on the financial status of the Social Security system. In this report, it uses a similar but slightly more sophisticated, or dense, measure of financial balance than the RFV: a single figure called actuarial balance. Briefly, the actuarial balance -- deficit or surplus -- reflects how much the contribution rate must be increased (decreased), to ensure that the Social Security buffer fund, the trust fund, never drops below a stipulated level in the standard 75-year projection of the SSA.

As noted, the main drawback of these measures, aside from all the very difficult issues related to the preparation of these projections, is one of presenting the right information. To provide a clear picture of the interaction that exists, we would like to know the financial position that preceded the one presented. We would also like to know the reasons for the change in the preceding period, and for each reason the magnitude of its effect on the change. This requirement can also be met for the conventional measures used in representing the financial position of pay-as-you-go pension systems, and it is indeed fulfilled occasionally for some change factors. But such figures do not come from the calculation of the actuarial balance measure itself, nor will such ad hoc analysis provide the self-controlling mechanism of double-entry bookkeeping. Thus, not even the public pension scheme probably best analysed by conventional methods – the US Social Security system – has provided information on such an interesting and elementary figure to show the cost of the annual change in life expectancy.

The double-entry algorithm is the standard, and so far the most efficient, way of simultaneously and consistently conveying financial position and changes in it. For this reason, double-entry bookkeeping ought to be our prime candidate as a way to improve financial reporting on pay-as-you-pension systems.

There are some additional reasons why it probably is better to go the full distance of establishing an income statement and balance sheet for national pay-as-you-go pension plans

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<sup>1</sup> The market value of the fund divided by one year of pension disbursements. In Sweden this measure is usually referred to as “fund strength”.

rather than trying to provide more measures and analysis along the conventional path. One is that the words used in income statements and balance sheets are more familiar to a wider circle of policy makers, journalists and informed members of the public than are the terms used in standard pay-as-you-go actuarial disclosure. The actuarial balance figure can also be criticized as unnecessarily abstract, since it does not explicitly mention liabilities, or assets to match them. However, the strength of this argument is questionable; with pay-as-you-go financing, the assets that should match liabilities are inherently abstract.

### 3 Pay-as-you-go assets?

The idea that the financial position of a pay-as-you-go pension plan can be presented in the terms of assets and liabilities does not come naturally, and indeed it may need some getting used to. However, to most people it seems clear that a pay-as-you-go system has liabilities, both to retired persons and to those who at the time of measurement are working and have accrued some pension claim. Opinions differ on the choice of method to estimate the value of this liability, but not its existence.

It is understandably more controversial to claim that the liabilities of a pay-as-you-go pension plan are fully or partially backed by something that we may call “assets”. A defining feature of pay-as-you-go financing is that it finances its payments not from pre-funded assets, but from current contributions. As a pay-as-you-go system has little or no tangible assets, it may be considered, by definition, to be in permanent deficit. While this view seems plausible, it may be impractical and perhaps even questionable on theoretical grounds.

For example, in the extremely unlikely event that a pay-as-you-go system with fixed contribution rate and benefit rules, contributions continuously and perpetually perfectly match pension payments, does this system have a deficit, or is it in financial balance? Reasonably, it can be considered to be in financial balance, i.e. have a net present value of zero. If a system with a liability of a defined and measurable size has a net present value of zero, it must also have assets equal to that liability. As opposed to a premium reserve plan, a pay-as-you-go pension plan is free to use contributions to pay off the pension liability, even when the contribution directly or indirectly is a source of a new pension liability. Thus, in a pay-as-you-go pension system, the contribution flow can and should be considered as the principal asset. The double-entry bookkeeping of the new Swedish pay-as-you-go pension plan is based on this reasoning. The Swedish concept of the value of the contribution flow is expressed in English as the *contribution asset*.

It is surprisingly simple to calculate the value of the contribution flow: it is the product of the size of the flow per time unit, which in practice is a year, and the expected time between payment of contributions and receipt of pensions. The averages are weighted by the age-dependent amounts of expected contributions and pensions. In Sweden the expected contribution-weighted average age of contributors is about 42, and the expected pension-weighted age of retirees is about 74. Information on these ages can annually be retrieved from the records of the pension plan. Thus, the relevant time span is about 32 (74-42) years, and the contribution asset is 32 times one year's contributions. In the Swedish legislation on the automatic balance mechanism, this time span is called *omsättningstid* – expected turnover duration -- as it is a measure of the time required for a cycle of accumulation and depletion of the pension liability.

The contribution asset, that is, contributions times turnover duration, tells us the size of the pension liability that would result in a steady state determined by demography, i.e. nativity, age-related net migration and mortality, and the economy of the country, i.e. the size of the contribution base and the age-related average incomes, at the time of measurement. The turnover duration measures informs, in a single figure, the effect that changes in fertility<sup>2</sup> and age-related income patterns have on the capacity of the contribution flows to finance pension liability.

## 4 Swedish use of an Italian device

The income statement and balance sheet of the *inkomstpension* plan for the years 2001, 2002 and 2003 are “reproduced” below. However, to facilitate international comparison, the amounts here are expressed in percent of GDP for each year, the appendix gives the original amounts in Swedish currency (SEK). The income statement consists of 13 genuine entries, of which only the four cash-flow statements were disclosed prior to 2001. The balance sheet consists of five genuine entries, of which only one – the market value of the buffer fund -- was disclosed prior to 2001. For each of the entries, there is a note with detailed information; here the notes will not be considered.<sup>3</sup>

The income statement is divided into three sections. section (a) *Change in funded assets* deals with the cash flows of the scheme, i.e. those flows that has changed the value of the buffer fund. This section contain no new information relative to what always has been reported. Noticeable is the – for a European context – low level of contributions and pension disbursements, around 6.5 percent of GDP. This is explained by the fact that the *inkomstpension* deals exclusively with earnings related old-age pensions. Thus disability pensions, the guarantee-pension and survivors benefits, which is slowly being phased-out of Swedish social security, are not included in the income statement nor in the balance sheet. Would those benefits be included expenditure would be around 10 percent of GDP. Presently contributions are larger than pension disbursements, a situation that is projected to continue up until around year 2010. From that time on pension disbursements are projected to surpass contributions, the deficit will be financed with the return on the assets in the buffer fund and also, according to projections, part of its capital. The buffer fund is valued at market prices the last trading day of the accounting period. As the buffer fund to 60 percent is invested in equities the sharp decline in prices on that market has fed into significant buffer fund losses in 2001 and 2002, losses that were partly regained by a positive development in 2003.

Section (b) *Change in contribution assets* deals with how much the contribution asset has changed due to change in contribution flow (revenue) and du to change in turnover duration respectively. As the contribution asset is calculated as the contribution flow times the turnover duration (TD) the separation of the effects from changes in two components imply that the

*Value from change in contribution revenue* (C) is:<sup>4</sup>  $C_t - C_{t-1} \approx \frac{TD_t + TD_{t-1}}{2} \cdot \frac{C_t - C_{t-1}}{C_t}$ . The *Value from change in turn over duration* is similarly calculated as  $TD_t - TD_{t-1} \approx \frac{C_t + C_{t-1}}{2} \cdot \frac{TD_t - TD_{t-1}}{TD_t}$ .

<sup>2</sup> In the legislation on the Swedish scheme, the effects of fertility changes on turnover duration are disregarded.

<sup>3</sup> The full reports can be downloaded free of charge from [www.rfv.se/english/publi/index.htm](http://www.rfv.se/english/publi/index.htm)

<sup>4</sup> Trough out this policy brief the different kinds of smoothing that is done according to the legislation is disregarded, for details see the technical appendix of *The Swedish Pension System Annual Report 2002*.

### Income statement of the *Inkomstpension* as a percent of GDP<sup>5\*</sup>

	2003	2002	2001
<i>GDP, millions of SEK (1 Euro = 9 SEK)</i>	2,440,058	2,347,400	2,266,387
<b>Change in funded assets (a)</b>			
Pension contributions	6.8	6.8	6,9
Pension disbursements	-6.4	-6.5	-6,3
Return on funded capital	3.4	3.6	-1,1
Costs of administration	-0.1	-0.1	-0,1
<i>Total change in funded capital (a)</i>	3.7	-3.3	-0,6
<b>Change in contribution assets (b)</b>			
Value of change in contribution revenue	6.6	9.6	17,9
Value of change in turnover duration	0.5	-0.7	0,7
<i>Total change in contribution asset (b)</i>	7.1	8.8	18,6
<b>Change in pension liability (c)</b>			
New Pension credits and ATP points	-7.1	-7.1	-6,1
Pension disbursements	6.4	6.5	6,3
Indexation	-9.4	-11.8	-5,1
Value of change in life-expectancy	-0.5	-0.3	-0,8
Inheritance gains arising	0.3	0.3	0,2
Inheritance gains distributed	-0.3	-0.3	0,0
Deduction for costs of administration	0.1	0.1	0,0
<i>Total change in pension liability (c)</i>	-10.5	12.6	-5,7
<b>Net income/ -loss (a)+(b)+(c)</b>	0.3	-7.1	12,3

\*A negative value (-) means that the pension liability increases, and a positive value ( ) that the pension liability decreases, by the amount shown.

Section (c) *Change in pension liability* informs of the reasons and magnitudes of changes in the size of the pension liability. The pension liability

- increases as *new pension credits* has been earned during the accounting period,
- decreases as part of the liability has been paid off as *pension disbursements* have been made, increases with the interest paid on the liability, i.e. the *indexation*,
- increases (decreases) with the *Value of changes in life-expectancy*,
- decreases with the *Inheritance gains arising* that is the value of the pension claims of persons that have died before beginning to draw a pension,
- increases with *Inheritance gains distributed* that is the survivor bonus distributed to those non retired and finally the pension liability, and finally,
- decreases with the reduction for administrative costs made of the insured's claim on the system.

### Balance sheet of the *Inkomstpension* as a percent of GDP

	Dec. 31 2003	Dec. 31 2002	Dec. 31 2001
<b>Assets</b>			
National Pension Funds	23.6	20.8	24,9
Contribution asset	224.0	225.5	224,4
<i>Total assets</i>	247.6	246.2	249,3

<sup>5</sup> Source for the numerators are *The Swedish Pension System Annual Report 2001, 2002 and 2003*. The GDP denominator used are from Konjunkturinstitutets konjunkturrapport, in March 2004.

### Liabilities and surplus

Opening surplus/-deficit	2.1	9.3	-2,7
Net income / -loss for the year	0.3	-7.1	12,3
Total (closing) surplus /-deficit	2.4	2.2	9,6
Pension liability	245.2	244.0	239,7
<i>Total liabilities and surplus</i>	<i>247.6</i>	<i>244.0</i>	<i>249,3</i>

The assets of the balance sheet are the market value of the buffer fund and the contribution asset, calculated as  $C_t \square TD_t$ . Even though the Swedish national pension plan has one of the largest buffer funds of any national pay-as-you-go pension plan it represents less than 10 percent of the pension liability.

The opening surplus is, naturally, the closing surplus of the preceding accounting period, as the GDP denominator changes between the years this important relationship is obscured. The opening surplus/-deficit plus the net income/-loss for the year gives the closing surplus for the accounting period. The fundamental accounting equality states that the (pension) liability plus the closing balance equal total assets.

If one single financial indicator is sought the natural, most information dense, is total assets divided by pension liability. In the translation of the Swedish accounting this figure is called *balance ratio*. If this ratio is less than one (1) the system has a deficit, a negative net present value, if it is above one the system has a surplus, a margin.

In some respects the balance ratio resembles the actuarial balance measure that SSA uses, but the income statement and balance sheet that comes with the balance ratio, and the notes tied to their entries, incorporates details on what *cause* provokes what *effect*, by what *means*, at what *rate*. Thus it is better at supplying the essentials of knowledge.

It is clear that if other administrators of national pension plans were to present their financial position the individual entries of their income statements and balance sheets, and the associated notes, need to be modified. This to comply with the specific demands of each plan, but the general outline should be possible to follow. However the work required in each case to be able to present a complete income statement and balance sheet should not be underestimated, neither should the rewards from a successful such effort.

A less ambitious endeavour, but still worth while financial indicator, would be to start to annually publish the change, most likely increase, of the pension liability caused by changes (increases) in life expectancy.<sup>6</sup> Even in the Swedish pension plan, which to my knowledge is the world's best financially insulated pension scheme relative to changes in life expectancy, the economic impact from such demographic changes are important.<sup>7</sup>

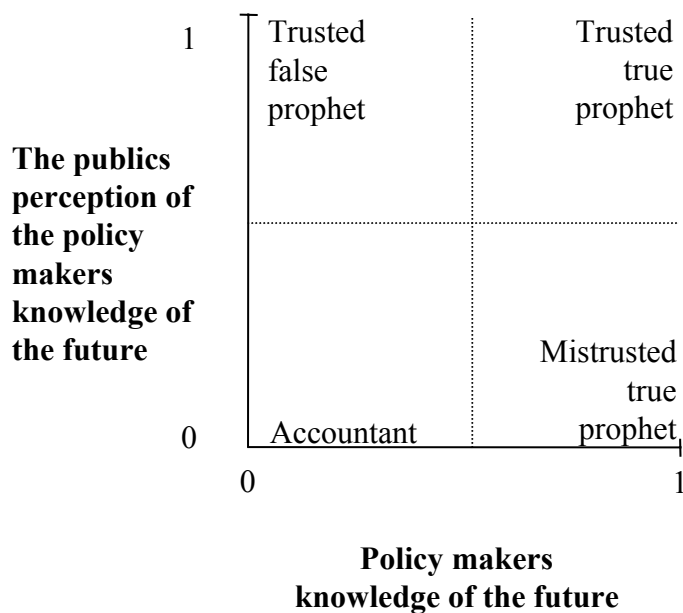
<sup>6</sup> If this is done the positive effect on the expected turnover duration from increases in life expectancy must be deducted.

<sup>7</sup> Viewed from another angle this efficient insulation can be view as efficiency in passing on the economic effects from increases in life expectancy to the insured.

## 5 Does it matter?

Will it make any difference if governments continue to furnish us with projected cash flows, perhaps boiled down to a figure reflecting “actuarial balance” as done in the US, or if they would start to present income statements and balance sheets and summarise them in a “balance ratio”? I believe it would make a difference. A “normalised”, double entry, way of reporting on financial position of national pension plans will provide both more detailed and better quality of aggregated financial indicators as the balance ratio, to both policy makers and the insured. Such improved information has the potential to promote better policies when it comes to stabilise the finances of national pension plans.

Figure 1 Four stylised policy makers – which one are you?<sup>8</sup>



Applying double entry bookkeeping might also promote a debate on to what extent the financial stability of national pay-as-you-go pension schemes ought to rely on future development of the demographic and economic factors that in defined benefit plan decide the plans financial development. And to what extent their financial stability should be less dependent of such demographic and economic factors by transferring risks and opportunities to the pension benefit-level. The *inkomstpension* is radical in that it transfers all demographic and economic risks to the insured.<sup>9</sup> This has made the accounting simpler than it will be in systems that instead, implicitly or explicitly places the risks on the contribution rate. In defined benefit pension plans the accounting will need explicit assumptions of the future. Doing this contains risks and opportunities – illustrated in figure 1 – that the accounting provisions for the Swedish pension keep away from.

<sup>8</sup> The essentials of this image came out of a discussion with Boguslaw D. Mikula at RFV.

<sup>9</sup> The risks that the insured are exposed to is reduced by the existence of the so-called guaranteed pension. This benefit is financed by general tax revenue, not contributions to the *inkomstpension* system.

## Appendix 1: Income statement and balance sheet of the *inkomstpension*

### Income statement, millions of SEK<sup>10</sup>

	2003	2002	2001
<b>Change in funded assets (a)</b>			
Pension contributions	165,107	160,745	156,811
Pension disbursements	-155,410	-151,757	-143,564
Return on funded capital	82,060	-84,529	-25,035
Costs of administration	-2,359	-2,081	-1,943
<i>Total change in funded capital (a)</i>	<i>89,398</i>	<i>-77,622</i>	<i>-13,731</i>
<b>Change in contribution assets (b)</b>			
Value of change in contribution revenue	159,964	224,275	405,877
Value of change in turnover duration	12,346	-16,763	15,745
<i>Total change in contribution asset (b)</i>	<i>172,310</i>	<i>207,512</i>	<i>421,622</i>
<b>Change in pension liability (c)</b>			
New Pension credits and ATP points	-172,567	-167,585	-138,627
Pension disbursements	155,410	151,562	143,564
Indexation	-228,288	-275,946	-116,287
Value of change in life-expectancy	-11,045	-5,923	-18,728
Inheritance gains arising	7,090	6,389	5,476
Inheritance gains distributed	-7,616	-6,617	-5,490
Deduction for costs of administration	1,475	1,478	923
<i>Total change in pension liability (c)</i>	<i>-255,541</i>	<i>-296,642</i>	<i>-129,169</i>
Net income/ -loss (a)+(b)+(c)	6,167	-166,752	278,722

### Balance sheet, millions of SEK

	Dec. 31 2003	Dec. 31 2002	Dec. 31 2001
<b>Assets</b>			
National Pension Funds	576,937	487,539	565,171
Contribution asset	5,465,074	5,292,764	5,085,252
<i>Total assets</i>		<i>5,780,303</i>	<i>5,650,423</i>
<b>Liabilities and surplus</b>			
Opening surplus/-deficit	51,645	218,397	-60,315
Net income / -loss for the year	6,167	-166,752	278,722
Total (closing) surplus /-deficit	57,812	51,645	218,407
Pension liability	5,984,199	5,728,658	5,432,016
<i>Total liabilities and surplus</i>	<i>6,042,011</i>	<i>5,780,303</i>	<i>5,650,423</i>

<sup>10</sup> Source *The Swedish Pension System Annual Report 2001, 2002 and 2003*.

## Appendix 2: A note on the simplicity of the new Swedish pension plan

The double entry bookkeeping of the new Swedish essentially pay-as-you-go financed pension plan has been much facilitated by the design of the *inkomstpension*. Very briefly these design features implies that the present value of pension liabilities in the pension scheme can be approximated to equal the nominal value of the pension liability. Further the nominal value of the pension liability to persons that have not yet started to draw a pension is much simpler than what is the case in other pension plans. The *inkomstpension* liability to persons who have not yet begun to persons still economically active is valued as the aggregate of the amounts on each individuals so-called “notional” account. This calculation entails a only a simple aggregation of what is in RFV computers for each person. The pension liability to retirees is also presented at its nominal value. This is done by multiplying pensions granted by the expected number of times that the amount will be disbursed. The number of expected disbursements is calculated from annual measurements of the length of the time that pension amounts in RFV records are paid out.

The nominal valuation of assets and liabilities of the Swedish pension plan imply that all valuations are made solely according to what is observable at the time of valuation. For example, the normal assumption that contribution revenue increases at the rate of economic growth is not explicitly considered in the calculation of the contribution asset. Nor is the assumption that pension disbursements, because of factors like indexation, will increase in the future considered in the valuation of the pension liability. The main reason why it has been deemed reasonable to value assets and liabilities solely according to what can be observed is that the financial position of the system is not dependent on the amount of assets and liabilities *taken separately*. The financial position of the system is determined exclusively by the *relationship* between assets and liabilities, in other words, by the so-called *balance ratio*.

The *inkomstpension* is designed so that there is a strong link between the development of the assets and liabilities of the system. In cases where the balance ration exceeds on (1), however, liabilities and assets will develop at somewhat different rates. In cases where the balance ration is less than one, the provisions for automatic balancing establish an absolute link between the rates of growth in liabilities and assets. Taken as a whole, this means that valuing the assets and liabilities of the system solely on the basis of conditions observable at the time of valuation entails no risk of overestimating assets in relation to liabilities in the long run.<sup>11</sup> Together with other design features the provisions for automatic balancing have eliminated the need for making explicit assumptions about future economic and demographic developments in order to ensure the financial stability of the system.

It is apparent from the above that the method for valuing the assets and liabilities of the *inkomstpension* system is implicitly based on the assumption that assets and liabilities grow at the same rate after each valuation. To put it another way, it is assumed in the method of valuation that the indexation of the system will always be the same as the internal rate of return of the pension liability, even though this outcome is certain only of balancing has been activated. When balancing has not been activated, the indexation can be either greater of less than the internal rate of return of the pension liability.

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<sup>11</sup> The manner of calculating turnover duration involves an implicit assumption that the population growth is zero. Thus, turnover duration will be (slightly) over estimated in cases where the working-age population is decreasing. This entails a risk that the calculations will (slightly) overestimate the system’s assets in relation to its liabilities. However, it is reasonable to assume that the population decline will cease at some point. If so, the deficit will be temporary.