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# Comment to The English Translation of The Legislation on the Automatic Balance Mechanism

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## **COMMENT TO THE ENGLISH TRANSLATION OF THE LEGISLATION ON THE AUTOMATIC BALANCE MECHANISM**

Enclosed is an unofficial translation of the legislation on the so-called automatic balance mechanism of the new Swedish public pension system. It is not a translation of the government bill that presented the proposed legislation that parliament adopted in May of this year. The bill explains both more generally and more in detail how the law will work. Further the bill also comments the reasons and as well as the foreseen alternatives to the automatic balance mechanism.

The balance mechanism is a part of the legislation governing the indexation of pensions and (notional) pension capital. As long as the balance mechanism is inactive the indexation of pensions notional pension capital is based on the growth in average income. Since the growth in average income normally will deviate from the systems internal rate of return this index implies that liabilities may grow faster than assets, or vice versa. If and when liabilities should exceed assets, the basis for indexation is automatically switched to an approximation of the system's internal rate of return, thus automatically adjusting pension levels as well. The pension level is automatically re-established, as is growth in average income as the basis of indexation, as soon as this is possible without undermining the financial balance of the system. Only historic transactions are used to calculate the liability and the assets. The valuation of assets is performed by a new concept, *expected turnover duration*.

The automatic balance mechanism secures the financial stability of the new pension scheme with a fixed contribution rate. The financial burden from a negative turn out of all potential risks of the pension scheme are, if financially required, distributed through the indexation of (notional) pension capital and pensions. Examples of risk factors are; fertility, labour force participation, mortality, the return on buffer fund capital and changes in income and mortality patterns. In most analysed scenarios, the balance mechanism secures that the buffer fund is not emptied. In some scenarios the buffer fund will be emptied but the fund will never go into severe long-term deficit. To handle a situation with a temporary negative buffer fund the funds have been entitled to finance obligations by borrowing.

For more information about the balance mechanism in English see "The Automatic Balance Mechanism – a non-technical introduction," Wirtschafts Politische Blätter 2001/4 also on the web site of the National Social Insurance Board, [www.rfv.se](http://www.rfv.se).

English, unofficial, translation of the legislation on The Automatic Balance Mechanism

**Chapter 1**

5 a §

*For each year the Government shall determine a balance ratio. This ratio shall show the relationship between the contribution asset of the pay-as-you-go system, with the addition of the reported market value of the assets of the First, Second, Third, Fourth and the Sixth National Pension Fund, and the pension liability of the pay-as-you-go system at the end of the second year preceding the applicable year for the balance ratio, hereafter referred to as the balance-ratio year.*

*By contribution asset is meant the value of the contributions to the pay-as-you-go system multiplied by the average number of years elapsing from the time when pension credit is earned to the time when the pension is disbursed (turnover duration). By pension liability is meant the total pension commitment of the pay-as-you-go system.*

5 b §

*Pension contributions are calculated as*

*1. the average income of the second-fourth years preceding the balance-ratio year, multiplied by*

*2. the estimated relative annual change in incomes in the second-fifth years preceding the balance-ratio year. In calculating the relative change in incomes, the annual change in the general price level in the same period from June to June shall be deducted. The resulting value shall thereafter be adjusted by the change in the general price level from June two years preceding the balance-ratio year to June of the year immediately preceding the balance-ratio year.*

*Turnover duration is calculated as the median of the turnover durations for the third, fourth, and fifth years preceding the balance-ratio year. The pension liability is calculated for the second year preceding the balance-ratio year, as the sum of*

*1. pension balances calculated in accordance with Chapter 5, 2 §,*

*2. the value of pension credits for the income-replacement pension, such value to be calculated in accordance with Chapter 4, 2–6 §§,*

*3. pension disbursements for each age group in December, multiplied by the estimated number of remaining disbursements of an average pension for the same age group, and adjusted by the interest-rate factor specified in Chapter 5, 12 §, second paragraph, and*

*4. the estimated value of future disbursements of the supplementary pension to individuals who have not yet begun to receive such a pension.*

*The Government may publish additional regulations for the implementation of the statutory provisions concerning the calculation of the balance ratio. The calculations are to be performed by the National Social Insurance Board*

5 c §

*If the balance ratio for a particular year is less than 1.00, the Government shall determine a balance index to be used for certain calculations in accordance with this statute. A balance index shall thereafter be determined for each year until such time as said index shall equal or exceed the income index. In the initial calculation of the balance index for such a period, the balance ratio shall be multiplied by the income index for the same year. For each succeeding year of the period, the balance index as thus calculated shall be multiplied by the ratio between the income index after year end and the income index prior to year end and thereafter by the balance ratio applicable after year end.*

## **Chapter 5**

### **6 §**

If the income index changes between the applicable year for a recalculation in accordance with 4 §, or, if no such recalculation is to be made, between the year in which the income index was determined and the year thereafter, the pension balance shall be recalculated to reflect this change. *For years for which a balance index is determined, the calculation shall reflect this index instead of the income index. The calculation shall be performed after the pension credit for the immediately preceding year has been determined and after the recalculation has been performed in accordance with 4 §.*

Formula for calculating the balance ratio

**1. The balance ratio,  $BR$ , is calculated as**

$$BR(t) = \frac{CA(t-2) + F(t-2)}{D(t-2)} \quad (1.0)$$

$$CA(t) = \bar{C}(t) \times \bar{T}(t) \quad (1.1)$$

$$\bar{C}(t) = \frac{C(t) + C(t-1) + C(t-2)}{3} \times \left( \frac{C(t)}{C(t-3)} \times \frac{CPI(t-3)}{CPI(t)} \right)^{1/3} \times \left( \frac{CPI(t)}{CPI(t-1)} \right) \quad (1.2)$$

$$\bar{T}(t) = \text{median}T[T(t-1), T(t-2), T(t-3)] \quad (1.3)$$

where

- $t$  = calendar year if the variable refers to flows, end of calendar year if the variable refers to stocks
- $CA$  = contribution asset
- $F$  = buffer fund, the aggregate market value of the assets of the First-Fourth and the Sixth National Pension Funds. By market value is meant the value which in accordance with Ch. 6, 3 §, of the National Pension Funds Act (2000:192) and Ch. 4, 2 §, of the Sixth National Pension Fund Act (2000:193), is to be shown in the annual reports of these funds
- $D$  = pension liability
- $\bar{C}$  = smoothed value for the contribution to the pay-as-you-go system
- $\bar{T}$  = smoothed value for turnover duration
- $C$  = contributions to the pay-as-you-go pension system, in accordance with accounting practice.
- $T$  = turnover duration
- $CPI$  = consumer price index from June

**2. The average retirement age,  $\bar{R}$ , is calculated as**

$$\bar{R}(t) = \frac{\sum_{i=61}^{R^*(t)} P_i^*(t) \times G_i(t) \times i}{\sum_{i=61}^{R^*(t)} P_i^*(t) \times G_i(t)}, \quad \bar{R} \text{ rounded off to nearest whole number} \quad (2.0)$$

where

- $i$  = age at end of year  $t$  for persons born in the same calendar year, or age group
- $R^*(t)$  = the oldest age group for which pensions have been granted in year  $t$
- $P_i^*(t)$  = total of pensions granted monthly in year  $t$  to persons in age group  $i$
- $G_i(t)$  = annualization divisor in year  $t$  for age group  $i$

### 3. Turnover duration, $T$ , is calculated as

$$T(t) = ID(t) + OD(t) \quad (3.0)$$

#### 3.1 Pay-in duration, $ID$ , is calculated as

$$ID(t) = \frac{\sum_{i=16}^{\bar{R}(t)-1} \bar{E}_i(t) \times L_i(t) \times (\bar{R}(t) - i - 0,5)}{\sum_{i=16}^{\bar{R}(t)-1} \bar{E}_i(t) \times L_i(t)} \quad (3.1.1)$$

$$\bar{E}_i(t) = \frac{E_i(t) + E_{i+1}(t)}{N_i(t) + N_{i+1}(t)}, \text{ for } \bar{E}_{\bar{R}(t)-1}(t) = \frac{E_{\bar{R}(t)-1}(t)}{N_{\bar{R}(t)-1}(t)} \quad (3.1.2)$$

$$L_i(t) = L_{i-1}(t) \times h_i(t) \text{ for } i = 17, 18, \dots, \bar{R}(t) - 1 \text{ där } L_{16}(t) = 1 \quad (3.1.3)$$

$$h_i(t) = \frac{N_i(t)}{N_{i-1}(t-1)} \text{ for } i = 17, 18, \dots, \bar{R}(t) - 1 \quad (3.1.4)$$

where

- $E$  = the sum of 16 % of pension-qualifying income calculated in accordance with Ch. 2 of the National Income Replacement Pension Act (1998:674) and 16 % of pension-qualifying income calculated in accordance with Ch. 3 of said act
- $N_i(t)$  = number of individuals in age group  $i$  who at any time have been credited with pension-qualifying income or imputed income and who have not been registered as deceased

#### 3.2 Pay-out duration, $OD$ , is calculated as

$$OD(t) = \frac{\sum_{i=\bar{R}(t)}^{R(t)} 1,016^{-(i-\bar{R}(t)+0,5)} \times L_i^*(t) \times (i - \bar{R}(t) + 0,5)}{\sum_{i=\bar{R}(t)}^{R(t)} 1,016^{-(i-\bar{R}(t)+0,5)} \times L_i^*(t)} \quad (3.2.1)$$

$$L_i^*(t) = L_{i-1}^*(t) \times he_i(t), L_{60}^* = 1 \quad (3.2.2)$$

$$he_i(t) = \frac{P_i(t)}{P_i(t) + Pd_i(t) + 2 \times Pd_i^*(t)} \text{ för } i = 61, 62, \dots, R(t) \quad (3.2.3)$$

where

- $R(t)$  = age of the oldest person receiving a pension in year  $t$
- $P_i(t)$  = total pension disbursements in December of year  $t$  to age group  $i$

$Pd_i(t)$  = total monthly pension disbursements to persons in age group  $i$  made in December of year  $t-1$  and ceasing in year  $t$

$Pd_i^*(t)$  = total monthly pensions to persons in age group  $i$  with pensions granted in year  $t$  and ceasing to be disbursed in year  $t$

#### 4. Pension liability, $D$ , is calculated as

$$D(t) = AD(t) + DD(t) \quad (4.0)$$

$$AD(t) = K(t) + E(t) + ATP(t) \quad (4.1)$$

$$DD(t) = \sum_{i=61}^{R(t)} P_i(t) \times 12 \times \left( \frac{Ge_i(t) + Ge_i(t-1) + Ge_i(t-2)}{3} \right) \quad (4.2)$$

$$Ge_i(t) = \frac{\sum_{j=i}^{R(t)} \frac{1}{2} \times (L_j^*(t) + L_{j+1}^*(t)) \times 1.016^{i-j-1}}{L_i^*(t)} \quad (4.3)$$

where

$AD$  = pension liability in regard to pension commitment on which disbursement has not yet commenced (pension liability to "economically active" individuals)

$DD$  = pension liability in regard to pensions currently being disbursed (pension liability to retired persons in the pay-as-you-go system)

$K$  = total pension balances in accordance with Ch. 5, 2 §, of the National Income Replacement Pension Act (1998:674)

$E$  = pension credit for income-replacement pension in accordance with Ch. 4, 2–6 §§, of said act

$ATP$  = estimated value of the National Supplementary Pension and so-called Basic Income Replacement Pension for persons who have not yet begun to receive these two pensions

#### Comment on the Formula for Calculating the Balance Ratio

The proposed method of calculating the contribution asset and the pension liability involves a numerical approximation of a continuous calculation and is based on assumptions which include the following:

- births and deaths of individuals are evenly distributed throughout the applicable year,
- contribution revenue and pension disbursements are evenly distributed throughout the applicable year.

The calculation is performed for age groups, not by calendar time. The calculation is based on a steady state with respect to the earning of pension credit and the disbursement of pensions.

### 1.0

The balance ratio for year  $t$ . The estimated assets and liabilities of the pension system at the end of the second year ( $t-2$ ) before the balance-ratio year can affect the indexing of the pension liability at the end of the year ( $t-1$ ) before the balance-ratio year. This shift of one year is necessary in order to avoid any element of forecasting in the calculation of the assets of the system.

### 1.1

In order to achieve a smaller standard deviation in the contribution asset, the latter is calculated on the basis of smoothed values for contribution revenue and turnover duration.

### 1.2

The smoothing of contribution revenue is achieved by calculating the average contribution revenue for the three most recently ended calendar years at the time of the calculation and by projecting this revenue one year ahead. The projection is linked to the calculation of the income index. This is achieved by using the underlying data (defined in a different manner) and inflation rate for the same years in projecting smoothed contribution revenue as are used in the recalculation of the pension liability.

### 1.3

In order to calculate the turnover duration for a particular year, it is necessary in principle to determine the pension credit of every individual. The pension credit for the year  $t-2$  has not been determined for all income earners in the autumn of  $t-1$ , when the balance ratio for the year  $t$  is to be calculated. For this reason, the smoothed value for the turnover duration for year  $t$  is based on the years  $t-1$ ,  $t-2$ , and  $t-3$ . For this purpose the median is considered preferable to an arithmetic mean. Since turnover duration is independent of the general development of incomes and prices, there is no need to make a projection for the value of turnover duration.

### 2.0

In order to estimate turnover duration in accordance with the proposal, there must be a division into pension-credit-accumulation duration and pension-disbursement duration. For this purpose an average retirement age is calculated annually. The average retirement is a mean, weighted by "pension capital," of the ages at which pensions are initially disbursed. The proposed calculation means that the supplementary pension and the income-replacement pension can be treated in the same manner. Furthermore, the calculation means that any correlation between amount of pension and age at disbursement will be taken into consideration.

In order to facilitate the calculation of turnover duration, the estimated age of retirement is rounded off to the nearest whole number. It is estimated that in so doing the maximum rounding-off error in turnover duration will be 0.2 year. This means that the maximum rounding-off error in the calculation of the contribution asset will be approximately 0.5 %.

### 3.0



Turnover duration can be divided into two segments. One is the weighted average time during which pension credit is earned and accumulated,  $IT$ ; the other is the weighted average time during which pensions are disbursed,  $UT$ .

$IT$  is calculated in accordance with 3.1.1-3.1.3 by first computing a mean value for the pension credit earned by each age group during the year of measurement. Thereafter, a calculation is made of the proportion of total accumulated pension credit that each age group would have earned, on the basis of the calculated mean, in an actuarially normalized collective. The term “age group” refers to persons born in the same year who have received pension credit at any time.

$IT$  could have been calculated more simply and directly by basing it solely on the change in pension credit earned during the year of measurement. The reason why the more complicated calculation method was chosen was that it results in a smaller standard deviation.

### 3.1.1

The ratio indicates the average time in years, weighted by pension credit earned, from when pension credit is earned until pensions are initially disbursed. The average pension credit earned for each age group,  $\overline{PR}_i(t)$ , is multiplied by the normalized number of persons insured,  $L_i(t)$ , in the age group. The product indicates the pension credit that would be earned by an actuarially normalized collective. The share of each age group, multiplied by the time remaining until the initial disbursement of pensions,  $\overline{R}(t) - i - 0.5$ , is added together with that of all other age groups. This sum is divided by the total pension credit of the actuarially normalized collective.

The calculation of the time during which pension credit is earned is based on the assumption that retirement occurs at an exact age – that is, the birthday on which the individual reaches the retirement age in accordance with equation 2.0. The deduction of 0.5 is made to take account of the fact that pension credit on average is earned at mid-year.

During the phase-out of the National Pension System, which for this purpose will continue through 2018, it will be possible to earn pension credit under that system as well as the new, reformed pension system. However, the calculation of turnover duration is based on the assumption that pension credit earned is equal to 16 % of the “contribution base”. This means that in regard to the earning of National Supplementary Pension credit, turnover duration is treated on the same basis as the earning of pension credit under the reformed rules. Thus, no consideration is given to the fact that a portion of the contribution base consists of National Supplementary Pension credit and that this pension credit will normally differ in amount from 16 % of the “contribution base”. Thus, during the phase-out of the National Supplementary Pension, there will be a risk of error in estimates of turnover duration. However, the margin of error will be quite limited and will rapidly diminish.

### 3.1.2

$E_i(t)$  is the pension credit of each age group earned in year  $t$  by each person who has earned pension credit at any time in year  $t$  or earlier.

### 3.1.3

$L_i(t)$  is the estimated normalized number of individuals of age  $i$  who at any time have received pension credit in year  $t$ .

#### 3.1.4

$h_i(t)$  describes the change during year  $t$  in the number of individuals in age group  $i$  who at any time have been credited with pension qualifying income or imputed income.

#### 3.2.1

The ratio indicates the average time in years, weighted by the amount of pension, from initial pension disbursement until final pension disbursement.

The estimated normalized pension for each age group,  $L_i^*(t)$ , reduced to take account of the norm  $1.016^{-(i-\bar{R}(t)+0.5)}$ , is multiplied by the time during which the age group has received a pension,  $(i-\bar{R}(t)+0.5)$ . This duration of disbursement, weighted by the normalized pension amount, is summed for all age groups. This sum is divided, in turn, by the sum of all normalized pension disbursements.

The calculation of disbursement duration is based on the assumption that retirement occurs at an exact age – in other words, on the birthday when the individual reaches the retirement age in accordance with equation 2.0. The addition of 0.5 is made in order to account for the fact that pensions on average are disbursed at mid-year.

#### 3.2.2

$L_i^*(t)$  may be taken as a relative number of individuals in age group  $i$ , weighted by the amount of their pension, who receive a pension in year  $t$ .  $L^*$  thus constitutes an economic life-expectancy table specific to the pension system.  $L^*$  is the result of a chained multiplication of "economic death rates".

#### 3.2.3

$he_i$  shows the change in pension disbursements to age group  $i$  during year  $t$  as a consequence of death (or revocation of retirement). Based on pension disbursements and not on the mortality of individuals, the calculation reflects the relationship, if any, between pension levels and mortality.

In certain cases pension amounts will be granted and disbursements will cease in the same year because the insured individual dies or (revokes his/her retirement) during that year. On average, such pension disbursements will have taken place for half a year and thus carry half the weight of amounts disbursed before the year of measurement. To correct for this factor, their weight is doubled in the calculation of  $he_i$ .

### 4.0

The pension liability can be divided into a commitment to persons who have not yet begun to receive a pension,  $SA$ , and a commitment to persons who are already receiving a pension,  $SP$ .

#### 4.1

The pension liability to persons who have not yet begun to receive a pension consists of the total of all pension balances at the end of year  $t$  ( $PB$ ). This total pension balance has been recalculated by adjusting it for the change in the income or balance index between year  $t+1$  and year  $t$  and for the factors of actuarial gains and costs of administration. The amount should be increased by the pension credit earned during year  $t$  and not included in the pension balance ( $PB$ ) at the end of year  $t$ . Furthermore, until the end of 2018, the pension liability should be increased by the estimated amount of supplementary pensions ( $ATP$ ), including the so-called income-replacement pension, to persons who have not yet begun to receive their pensions.

#### 4.2

The pension liability to persons who are already receiving a pension is calculated as the sum of pension disbursements to each age group in December, multiplied by 12 and the expected average number of remaining years in which the pension is to be disbursed. In order to smooth out temporary variations in average (economic) life expectancy, the number of remaining years is measured as a mean of the  $De$  measured for the three most recent years.

#### 4.3

$De$  is the "economic annualization divisor," an estimate of the expected average remaining time for which a pension is to be disbursed to each age group. Individual pension amounts are proportional to the disbursement profile which results from economic adjustment indexing by the norm of 1.6 %. In addition, this profile is weighted according to the life-expectancy table calculated specifically for the pension system in equation 3.2.2 (by calendar time), divided by the same "population",  $L^*$ , at the outset of the calculation period. This ratio reflects the estimated normalized distribution of pension disbursements over different ages.

Note that even on the first age group is affected by economic-adjustment indexing. The calculation in which  $De$  is used is performed at year end; thus, disbursements after year end will be indexed once even for the youngest age group. This explains the exponent given to the norm of 1.016 in equation 4.3.