Historical Background

Pension Funds

MsC Finance

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It is worth making the **poin**t at the outset that **pensions** and **retirement** are **inventions** of the **late nineteenth** and **early twentieth** centuries in developed economies.

Before this, people in what are now developed economies did not retire; they continued working until they dropped, often ending their lives in the ‘poor house’.

Bismarck created the world's first **state pension system** in Germany in the 1880s.

During the **twentieth century**, state and occupational pension schemes developed in the other countries of Europe and in developed economies as far apart as the USA and Australia.

However, in many parts of Africa, Asia and Latin America, even today the idea of retirement and pensions remains a dream.

As seen before, for those people living in developed countries, it is conventional to talk of three pillars of support in old age.

The most important of these pillars in the context of retirement income provision in OECD countries is social security, which, given its universality and scope, is undoubtedly the key element of the framework of retirement income provision and thus of the room for development of private pensions.

Conceptually, social security overcomes the **capital market risks** such as inflation and recession to which pension plans may be vulnerable, as well as having advantages in terms of redistribution.

But this is at a cost in terms of vulnerability to **political risks** that benefit promises will be reneged upon, as well as causing numerous distortions to free operation of markets.

It is usually also unfunded or pay-as-you-go, with workers paying pensioners directly.

Unlike private occupational pension plans, the backup for the benefit promise is not assets or corporate profits but the power to tax.

This facilitates the transfer of longevity risk and risks arising from the performance of the economy away from the elderly (thus insulate them from income shocks)

Pillars or Tiers of retirement-income provision

The ***first pillar*** *is provided by the state as part of its social security system.*

There are two main types of social security system, **Beveridgean** and **Bismarckian**.

A ***Beveridgean*** *system provides just sufficient support to* keep people off the breadline; if people want to enjoy a higher standard of living, they are expected to make their own alternative arrangements.

The **UK** and **USA** have Beveridgean social security systems.

Bismarckian system

A ***Bismarckian*** *system provides much more generous support, often at a level that does* not require individuals to make additional arrangements.

Germany, Italy and France have Bismarckian social security systems.

Alternatively, **two polar types of social security** can be distinguished:

- Universal basic systems, which usually offer flat-rate pensions, and which seek to provide a minimum standard of living for all pensioners, financed by general tax; and

- Insurance based systems offering earnings-related* pensions which aim to provide a standard of living similar to that obtained during working life, financed by earnings based contributions.

* The usual methods of calculating benefits are either the pensionable wage base times an accrual factor, or average lifetime earnings revalued to allow for inflation.

The objectives of these differ, being, respectively, **alleviation of poverty** (by providing a minimum income) and **income maintenance** (keeping living standards in retirement close to those in employment).

Both have in common the DB approach and feature protection against inflation and against longevity.

Social security tends to be analysed in **three** main frameworks:

1. The **tax-transfer approach** sees social security as one form of current welfare transfer among others, with no special link between taxes and benefits. Appropriate application of the burden of contribution should follow the principles of taxation (such as taxes being based on the ability to pay and to minimize distortion to economic decisions).
2. The **insurance model** contrasts by focusing on the life cycle, and assumes government is merely substituting for a private insurance company in facilitating income shifting over a life cycle, albeit with advantages in relation to adverse selection, inflation protection, etc. On this view it is inappropriate to separate contributions and benefits, in that the former are seen as akin to insurance premium, directly linked to benefits, and that both are earnings related.
3. The **annuity-welfare model** takes account both individual equity (insurance) and social adequacy (tax transfer), thus linking the other approaches.

First pillar

The **first pillar** is financed by **collecting tax** (part of the social security tax that the government raises) from workers and paying it out immediately to pensioners.

In other words, it is known as an **unfunded system**, since (usually) no fund of pension assets is accumulated.

Clearly the level of social security tax collected will be lower in the former than the latter systems.

First pillar

Most first pillar schemes are (non-financial) **defined benefit** in nature.

Recently, countries such as **Sweden** and **Poland** have experimented with *non-financial (or notional)* ***defined contribution*** *(NDC) schemes for* their first pillar (see Holzmann, R. and Palmer, E. (eds) (2006) *Pension Reform: Issues and Prospect for Non-Financial Defined Contribution Schemes,World Bank,Washington,* DC.).

Reading: Settergren, Ole (1999) The Automatic Balance Mechanism of the Swedish Pension System, NSIB and KG Scherman (2003) The Swedish pension reform: a good model for other countries?, NFT 4

First pillar - NDC

These are unfunded schemes in which members have individual defined contribution (DC) accounts in which the returns that are credited to the contributions are not related to the returns on financial assets, but to some non-financial variable, such as the **growth rate** in the country's **GDP** or the **growth rate** in **national average earnings** (denoted *g below).*

The contribution rate is a fixed proportion of earnings.

First pillar- NDC

At retirement, the **notional capital** in the

member's account is converted to a life annuity, using an *annuity factor* that reflects both the **cohort life expectancy** of the member and the **rate of return** on the scheme over the expected term of the annuity.

Annuity factor

An **annuity factor** shows the present value of one unit of pension payable annually for the life of the pensioner.

The discount rate for calculating this present value is related to return on the nonfinancial variable used by the scheme during the accrual stage, such as the growth rate in the country's GDP or the growth rate in national average earnings.

The **estimated length of life of the pensioner** is set equal to the life expectancy of the member's birth cohort (i.e., all people born in the same year as the pensioner).

The **annuity factor** is divided into the notional capital to get the total annual pension.

The Time Value of Money

A unit of money (say $1) is more valuable today than it will be if it is received in one year's time and $1 in one year's time is more valuable than it will be if it is received in two years' time.

Money becomes less and less valuable, the further into the future it will be received.

So if we are to **receive** $1 today, $1 in a year's time and $1 in two years' time, we cannot just add the three dollars together and say we have$3.

We have less than this in **present value terms**.

Present value

The present or current value of a sum of money to be received in the future is found by discounting.

To do this we need to know the interest rate or **discount rate**. Suppose it is possible to borrow or lend at a riskless rate of interest of 10%.

Then $1 to be received in one year's time has a present value of:

$$\$1/(1.1) = \$0.91.$$

Present value

This is because if we had $0.91 today, we could save it for one year, earning 10% interest, and have exactly $1 in a year's time:

$$\$0.91 + 0.1 \times \$0.91 = \$1.$$

Similarly, the present value of $1 to be received in two years' time is:

$$\$1/(1.1)2 = \$0.83.$$

Present value

This is because if we had $0.83 today and saved it for a year, we would have $0.91 in a year's time and if we then saved the $0.91 for another year we would have exactly $1 in two years' time.

The **present value of the three dollars** is therefore **$2.74.**

Financial Balance - *NDC*

The system is kept in **financial balance** to ensure that the present value of system assets (PV(*A)), i.e., the accruing notional capital, always* equals the present value of system liabilities (PV(*L)), i.e., the expected* pension payments: **PV(*A*)=PV(*L*)**

This is achieved by using an **adjusted rate of return** $g + \rho$,

where $\rho = [(PV(A)/PV(L)) - 1]$.

The effects of demographic and economic shocks are therefore accommodated endogenously within the scheme and within each cohort, since the credited return on the scheme, $g + \rho$, *adjusts the member's notional capital during both the* accrual and payment stages and the annuity paid at retirement reflects changes in birth cohort life expectancy.

$1+ \rho= PV(A)/PV(L)$

NDC schemes have four properties (Palmer, 2006):

- At any time, the present value of an individual's lifetime benefit equals the individual's account balance.
- To maintain a fixed contribution rate, total NDC system assets must equal or be greater than total liabilities.
- The NDC benefit is constructed as a life annuity, reflecting life expectancy at retirement.
- Financial balance requires the accounts be valued at the rate $g + \rho$.

Conclusion - NDC

NDC schemes can be interpreted as exhibiting **intergenerational fairness**, since each generation pays the same contribution rate as a proportion of earnings and receives a pension based on its own economic performance over its lifecycle and its own mortality prospects.

See also critics:

Scherman, KG (2003) The Swedish pension reform: a good model for other countries?, NFT 4.

Second pillar

The *second pillar is provided by the companies in the form of occupational pension schemes or plans.*

Companies are said to sponsor such schemes.

Typically, occupational pension schemes are funded, i.e., a fund of pension assets accrues from the contributions or premiums paid by the employer (the scheme sponsor) and worker (the scheme member) and from the investment returns on these contributions.

The pension is paid from the **accrued fund** once the member retires. Sometimes (and this is more common in smaller companies than larger companies), the accrued fund is given to a life assurance company which then provides a life annuity to the retiree.

Second pillar

There are **three classes** of pension scheme **member**:

- the ***active member,*** who still works for the company and is still making contributions;
- the ***retired member****, who has retired from the company and is drawing a* pension; and
- the ***deferred member****, a worker who is no longer working*

for the company and has not yet retired, but has accrued rights to a pension on the basis of his previous service for the firm and associated membership of the scheme – the pension then becomes payable when the deferred member retires from his last job.

Second pillar

Although most occupational pension schemes are funded, the calculation of the pension benefits can differ widely between different types of scheme.

There are **three** main types of occupational scheme: *defined benefit (DB), defined contribution (DC) and hybrid.*

Second pillar

Until recently, the most common type of scheme was a DB scheme.

In such a scheme it is the benefit that is defined and the scheme promises to pay a pension, based on this defined benefit, whatever the size of the fund backing this promise.

The **simplest DB** scheme offers a fixed monetary pension at retirement, irrespective of earnings or subsequent inflation.

Such schemes are common in Germany and the USA (where they are known as *fixed benefit or fixed amount plans).*

Second pillar

However, the **most common type of DB** scheme is a *salary-related scheme. The most common of these is the* ***final salary scheme****, in which* the pension paid is related to the salary earned in the final year of employment (or the average of the final three or five years of employment) of the scheme member.

The actual pension is some fraction of the final salary, where the fraction is calculated as the product of the accrual rate (e.g., 1%) and the number of years of service.

Example

Assumptions:

The plan pays a benefit equal to 1% of final salary per year of service

Plan participants enter the plan at age 25, retire at age 65, and live until age 85 (working period=T=40; retirement period=N=20).

The employee's salary grows at the rate of inflation, which is 5% per year (i=5%). The interest rate used for discounting nominal annuities is 9% per year (d=9%).

Pension benefit=FS1%t, FS=Final Salary;

$$FS = S(1+i)^t$$

t=1,…,T

Source: Bodie, Z. (1990) Pensions as retirement income insurance, *Journal of Economic Literature, 28, 28–49.*

Present value of **new benefits earned** (%)

$$\frac{S\left[(1+i)^{t}t\% - (1+i)^{t-1}(t-1)\%\right] \times \left[\frac{1}{1+d} + \ldots + \left(\frac{1}{1+d}\right)^{20}\right]}{(1+d)^{40-t}}$$

$$S(1+i)^{t}$$

Present value of **new benefits earned** (%)

$$\frac{\left[(1+i)^t t\% - (1+i)^{t-1}(t-1)\%\right] \times \left[\dfrac{(1+d)^{20}-1}{d}\right]}{\dfrac{(1+d)^{60-t}}{(1+i)^t}}$$

Given

$$S_n = u_1 \frac{(1-r^n)}{(1-r)}$$

Value of **accrued benefits** (%)

$$\frac{S(1+i)^t \, t\% \left[\frac{1}{1+d} + \ldots + \left(\frac{1}{1+d} \right)^{20} \right]}{(1+d)^{40-t}}$$

$$S(1+i)^t$$

Backloading

Table below shows the value of pension benefits as a proportion of final salary.

The table shows that benefits are ***backloaded****: the present value* of benefits earned in each year is greater in later years than earlier years. In other words, pension accruals in final-salary defined benefit funds tend to increase with the time that the worker remains with the same firm.

For example, the present value of benefits earned in the **10th year** of membership is 0.98% of final salary, while that earned in the **40th year** is equal to 26.08%.

Value of pension benefits as a proportion of salary

Year of employment	Present value of new benefits earned (%)	Value of accrued benefits (%)
1	0.32	0.32
10	0.98	6.88
20	3.10	32.58
30	9.18	115.68
40	26.08	365.14

Backloading

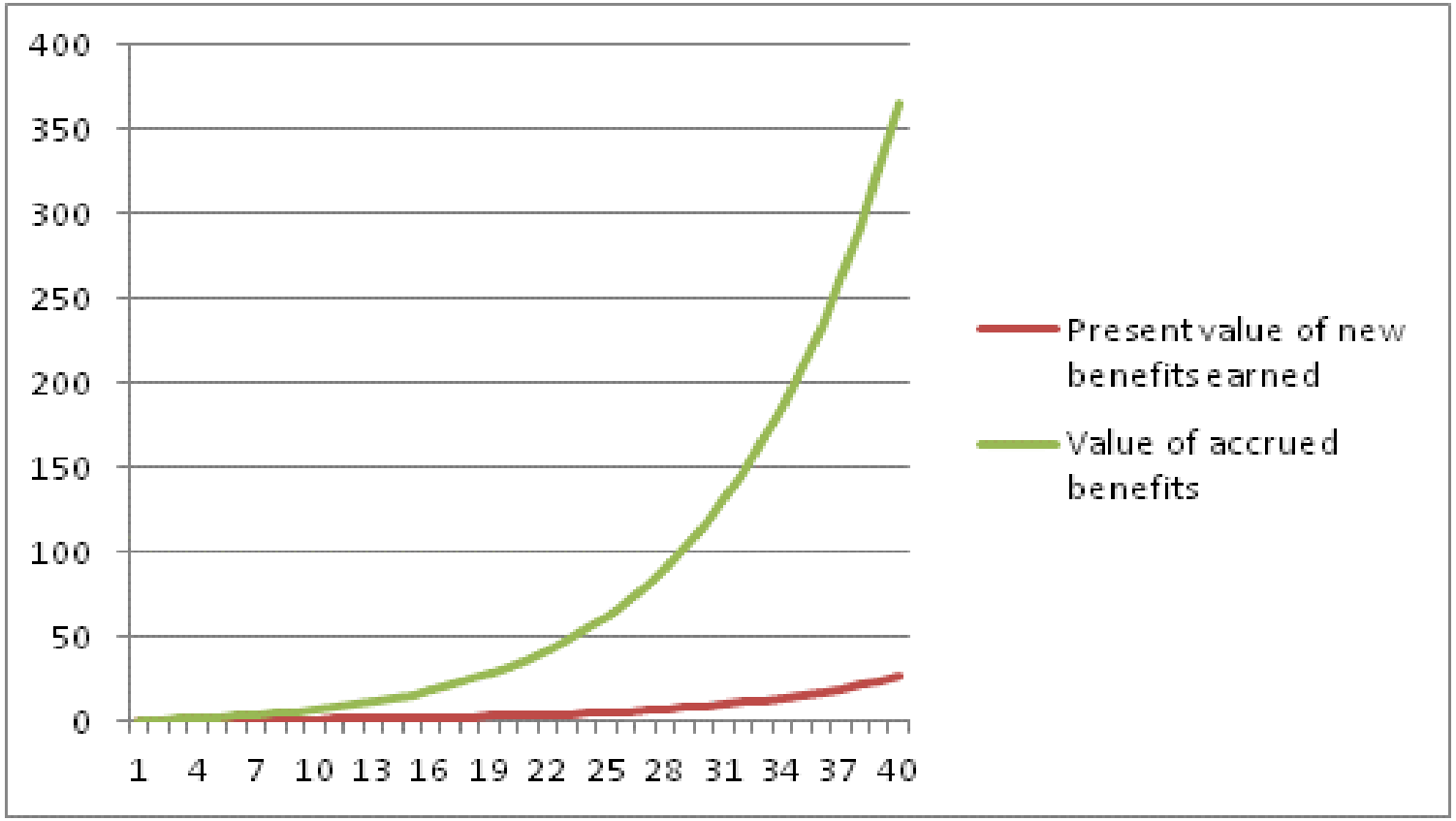
The backloading is caused by two factors: the time value of money and inflation.

An older worker is closer to retirement than a younger worker and so the present value of an additional unit of pension benefit is higher for the older worker.

Inflation increases backloading for two reasons:

- First, by increasing the nominal interest rate, it magnifies the time value effect.
- Second, by increasing nominal wages, it will magnify the uprating component of the benefit earned each year. With each additional year of employment, an additional year of service is earned and the nominal salary is higher.

Backloading



Implications of *Backloading*

Thus, defined benefit plans can assist the employer by **reducing labour turnover**, if vesting is imperfect, i.e. early leavers do not gain a proportionate share of benefits in relation to contributions and effectively subsidize long-stayers (so that employees accrue pension rights only after several years of contribution made on their behalf).

[The vesting period is the period during which contributions are made by and/or for the employee before he obtains corresponding rights to a pension.]

In addition, non-indexation of frozen benefits of a job-changer may make the pension virtually worthless, thus discouraging job-switching.

Even with perfect vesting and inflation-indexing, workers tend to lose out by changing between defined benefit plans when they move jobs compared with those remaining in one plan.

This is the case because average earnings tend to rise faster than prices in most countries, and also because of promotions (the frozen part of the workers' pensions will be based on the low salaries that they earned early in their careers.

Only 'transfer circuits' (for example, the insurance sector in Portugal), which alow shifts between similar defined benefit plans on an agreed basis, can avoid these problems entirely.

These effects may of course be a **mixed benefit to the economy** as a whole, as they imply that plans can be a source of **labour market inflexibility**.

Consistent with these arguments, studies find that workers with pension coverage are less mobile than those without.

Alternatively, acceptance of backloading by young workers joining a firm with a defined benefit plan may **screen workers** to attract those with a long term commitment.

The structure of defined benefit plans also has an important role to play in the **retirement decision**. They often offer increasing pension wealth only up to the first optional retirement date, after which it turns down. At some point, this will offset the accrual of social security wealth sufficiently to leave the workers's rewards from continuing work below the value of his leisure time, offering a powerful inducement to retire. Some would suggest tha DB plans give an incentive to sack older works, given the cost of increasing benefit accruals.

In addition, research show that workers with generous private pensions tend to retire earlier than those with less generous ones.

DB plans may be a better way of providing incentives to maintain a high level of effort throughout the employee's career, as pensions depend on pay at retirement, whereas DC plans accrue evenly throughout the career.

Second pillar

More recently, ***average salary schemes*** *have been introduced: the* pension is based on the average salary earned during the member's career.

A number of industry-wide schemes in Holland, for example, have switched from final salary to career average. In career average revalued earnings (CARE) schemes, the average salary calculation corrects for general price or wage inflation that occurred over the member's career.

CARE schemes therefore lie in between average salary and final salary schemes in terms of the generosity of pension benefits.

Second pillar

Another type of DB scheme is the ***retirement balance scheme****.*

The benefit is defined in terms of a lump sum rather than a pension and it is typically measured as the multiple of an accrual amount (a specified percentage of career average salary) and years of service.

If final rather than average salary is used, such schemes are known as *final salary lump sum or pension equity schemes.*

They are common in Japan and Australia.

They are not proper pension schemes, however, unless the lump sum is used to buy an annuity, and hence provide lifetime income security.

Second pillar

A DB scheme will show a ***surplus*** *if the value of the assets in the pension* fund exceeds the value of the liabilities, namely the present value of the future promised pension payments.

A DB scheme will show a ***deficit*** if the value of the liabilities exceeds the assets.

Pension regulators or supervisors (appointed by the government) generally impose strict rules on the elimination of both surpluses and deficits (see ISP-Insurance and Pension Funds Supervisory Authority , in case of Portugal).

Second pillar

Surpluses are typically eliminated through *sponsor contribution holidays, i.e., the sponsor stops* making contributions to the fund until the surplus has been eliminated.

Deficits are eliminated through a **series of deficiency payments**, i.e., additional contributions from the sponsor, that extinguish the deficit within a specified recovery period, such as 5–10 years or the average remaining service life of the company's workforce (typically around 15 years).

Increasingly, DB schemes are being replaced with DC schemes.

DC schemes

In such schemes (DC), it is the rate of contributions into the scheme that is defined.

The contributions might be a fixed annual amount or they might be a fixed percentage of salary.

The pension will depend on the value of the fund accrued by the time of retirement.

No particular level of pension is promised with a DC scheme.

DC schemes

If the value of the fund is low, either as a result of low contributions or poor investment performance, then the pension will be low as well.

If, on the other hand, the value of the pension is high, the pension will be correspondingly high.

By definition, DC schemes show **neither surpluses nor deficits**.

Hybrid schemes have a mixture of DB and DC components.

DC schemes are generally less restrictive in vesting and more portable.

[Portability is the right of an employee to transfer vested pension rights between employers without loss of value.]

DC schemes can be constructed with backloanding since they can be designed with contribution rates by the employer tied to tenure and age to have a disincentive effect on early leavers, but they tend in practice not to.

The accrual pattern of the typical DC plan also gives possible grounds for concern. If investments returns are expected to exceed wage inflation, the contribution to the final pension is greater for the initial payments than the later ones. But the early contributions are least likely to be made, as the young enployee may not be allowed, or will not choose, to join the scheme.

The optimal choice between DB and DC plans in this context may depend on the fluidity of employment. DC plans, being more portable, have an advantage if workers are to have several employers over their working lives, or if they are able to offer only temporary or contract work.

Third pillar

The *third pillar is any additional savings for retirement that the individual* chooses above that provided by the state or the company for whom the individual works.

These savings will typically be held in deposit accounts or in mutual funds invested in equities or bonds.

If the individual chooses to do this via a formal pension scheme, it will almost invariably be in the form of a DC scheme, known as a ***personal pension scheme*** or an ***individual retirement account***.

Third pillar

Other assets can also be used to provide income in retirement.

The best example of this is the domestic home. When they retire, individuals sometimes sell their home and buy a smaller one in order to increase their spending power in retirement; this is known as **trading down**.

Third pillar

An alternative is to borrow against the equity in the home and allow the interest to roll up.

The initial loan and the rolled-up interest are repaid at the time of death of the occupant out of the proceeds from selling the home. This is called *home equity release.*

Fourth pillar

Increasingly there is a *fourth pillar of support in old age, and that* is post-retirement work.

Sometimes this is by choice. Some individuals do not like the idea of being fully employed one day and then having no work to do the next.

Such individuals prefer a gradual entry into retirement.

For other individuals, there might be no choice but to take a part-time job to make ends meet.