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# Pension funds – Future prospects and uncertainties

*Pension fund assets were well in excess of one year's GDP at the end of 2004. The current outlook is that these assets will grow by roughly the same amount again over the next 10 years. More than one-fifth of pension fund assets are in the form of foreign portfolio investments, and a larger proportion of the additional capital will presumably need to be invested abroad. Pension fund profitability is determined by the life expectancy of fund members, the length of their working life, wage developments and the return on the funds' investments. This paper presents examples of the scale of these factors, focusing in particular on related uncertainties and their effect on the funds' operations. Iceland's large-scale monetary savings through pension funds are not found to be matched in the level of national saving.*

Retirement pensions have become a serious fiscal concern in most industrialised countries. Pensions are largely paid for from tax revenues and it is foreseen that contributions will need to be raised substantially during the coming decades. The reasons are that large age groups are now nearing retirement age, and that the populations of these countries live longer and have fewer children than in the past. The ratio of pensioners to people of working age will therefore rise substantially in the twenty-first century. A comparable change in the distribution of age groups is also seen in many developing countries, including both India and China.[3]

Although the number of elderly people in Iceland will also rise relative to the population of working age, this is less cause for concern than in many other countries. There are two main reasons. One is that the projected change in age distribution is less marked than in comparable European economies, because of Iceland's higher birth rate and retirement age. Second, Iceland's pension system is for the main part based on each individual saving a portion of his or her wages in a fund that is later used for paying the pension. Therefore there is no need to increase taxation even though the proportion of pensioners increases.

By the end of 2004, Icelandic pension funds held assets of almost 1,000 b.kr., while GDP the same year amounted to 885 b.kr. Contributions to pension funds are still far in excess of payments from them. Pensioners are few in proportion to working fund members, and most have only paid contributions from their total income for part of their working life and are therefore entitled to relatively small benefits. Furthermore, funds receive income on their investments. Their assets therefore look set to increase substantially over the coming years, unless equity prices slump.

The number of old-age pensioners is expected to rise relative to the working-age population and their benefit levels will be higher.

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According to a report by the Financial Supervisory Authority (FME),[4] the funds' assets and expected contributions from current members will not entirely cover their future commitments. The main shortfall is faced by funds with employer guarantees, namely in the public sector, although these also have sizeable assets. On the whole, however, Icelandic pension funds face only a minor challenge compared with the problems looming over the systems of most advanced countries.

Iceland's success in resolving its pension fund issues can be attributed to mandatory saving. From 1990 to 2004, mandatory pension savings generally amounted to 10% of occupational income, but contributions have now widely been raised by a further 1% or 2% of wages. Furthermore, for employees who pay 2% into a supplementary pension savings plan, the employer's matching contribution has also been raised to 2%, so that most people may be expected to take part in such schemes. Interestingly, notwithstanding all the monetary savings made through the pension fund system, the level of national saving in Iceland is low compared to other countries.

A fairly broad consensus appears to prevail on the pension framework in Iceland, which can congratulate itself on choosing a different system from other countries with similar living standards. The biggest bones of contention have been the lack of choice of pension fund and the low current benefit level of many pensioners.

The main theme of this paper is the pension funds' capital assets and their development. It begins by describing the financial position of the funds with some historical background, followed by an estimate of their size 20 years hence. The performance of fully funded schemes is governed by both demographic and economic factors. Decisions on contributions and pension benefits depend on projections of these factors many decades ahead. Examples of the effects of some factors are given, with a discussion of the uncertainties surrounding them and their impact on the funds' operations.

## The financial position of the pension funds

The main role of pension funds is to provide their members with sufficient income after they retire. Funds also pay survivors' and disability benefits. The pension system is commonly divided into three pillars. The first pillar is the pay-as-you-go system based on payments by public institutions – in Iceland, the State Social Security Institute – which are funded by tax revenues. The second pillar constitutes fully funded pension funds with mandatory membership and the third pillar is based on fully funded pension saving schemes with voluntary membership.

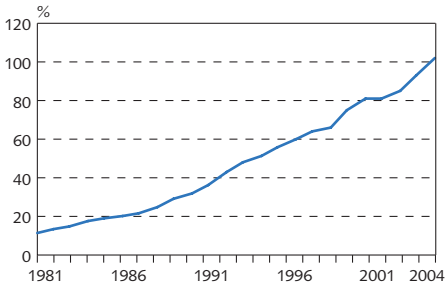
In Iceland, the main pillar consists of pension funds with mandatory membership. The present Act on the Mandatory Guarantee of Pension Rights and the Operation of Pension Funds dates from 1997, with subsequent amendments. It contains provisions for a minimum contribution amounting to 10% of wages, which for a time was the most common level, although most funds now stipulate a higher rate

4. FME: Lífeyrissjóðir. *Ársreikningar 2004 ásamt kennitölum og öðrum upplýsingum*. [Pension funds, Annual Accounts for 2004 and other information] Reykjavík 2005.

for contributions. Article 4 of Act No. 129/1997 is now more relevant. It states that "the minimum insurance benefits provided by a pension fund, based on a 40-year contribution period, shall amount to 56% of the monthly wages for which contribution is paid, as a monthly old-age pension for the duration of life from such time as the pension is first paid, but no later than from 70 years of age." According to Regulation No. 391/ 1998, on the Mandatory Guarantee of Pension Rights and the Operation of Pension Funds, this provision is construed as a minimum benefit of 1.4% p.a. under linear benefit rules and an average of 1.4% per annum under age-related rules.

Icelandic pension funds have undergone major changes in recent decades. Most employees became members of pension funds after 1970, paying a contribution of 10% of their basic wages. Separate funds operated for different occupations and trade unions. Pension funds for public sector employees and some professions were considerably older. This arrangement has undergone various changes. The self-employed joined the system in 1980 and from 1987 to 1990 it was extended to cover all wages. The FME supervises the operations of pension funds and publishes reports on them.

Chart 1
Average net assets as a % of GDP




*Source:* Central Bank of Iceland.

**Size of the pension funds**

Table 1 shows the size and scope of the general pension funds and total funds by the end of 2004 as well as figures from their statement of payments.

Table I Size and scope of pension funds at end-2004

| *In b.kr.* | *General pension funds*[1] | *Total pension funds* |
|---|---|---|
| Net assets | 738.8 | 986.5 |
| Contributions | 42.9 | 75.1 |
| Operating and investment cost | 2.0 | 3.0 |
| Pensions, total | 16.4 | 31.1 |
| Old age | 9.9 | 20.8 |
| Disability | 4.5 | 5.2 |
| Surviving spouse | 1.7 | 4.7 |
| Surviving child | 0.3 | 0.3 |
| Other | - | 0.2 |

1. General pension funds accept mandatory contributions and employers do not guarantee their commitments.

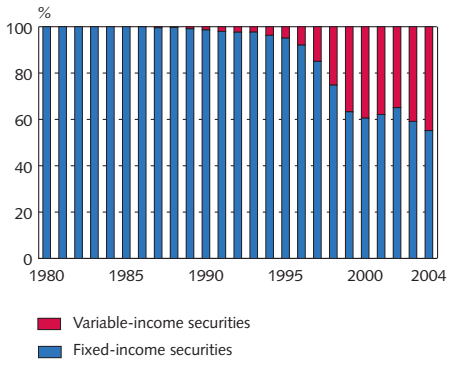
Source: FME (2005).

Table 1 shows that net assets of the pension funds amounted to 986.5 b.kr. at the end of 2004; the average over the year was equivalent to just over 102% of annual GDP. Chart 1 shows the rapid growth in net assets in recent years. Growth stagnated relative to GDP in 2001, however, when a global downturn in equity prices caused substantially negative returns.

The composition of pension funds' securities portfolios has changed sharply over the past ten years. Variable-income securities accounted for only 5% of total portfolios in 1995 but had reached 45% in 2004, as shown in Chart 2.[5]

5. Variable-income securities yield market rates of return and consist of equities and units in mutual funds and investment funds. Fixed-income securities carry a fixed interest rate.

Chart 2
Pension funds' securities portfolios
1980-2004




*Source:* Central Bank of Iceland.

Roughly half of the variable-income securities in the funds' portfolios in 2004 were issued by non-residents.

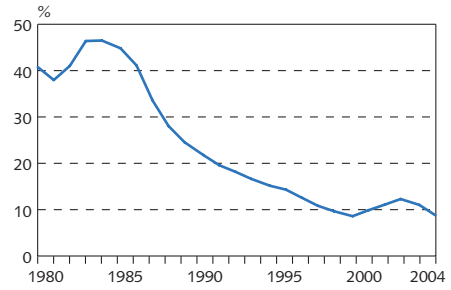
Table II Assets of pension funds

| | *Position in b.kr. at end-1995, at 2004 prices* | *% of net assets* | *Position in b.kr. at end-2004* | *% of net assets* |
|---|---|---|---|---|
| Fixed-income securities | 313.2 | 87.4 | 524.3 | 53.1 |
| Housing bonds | 197.4 | 55.1 | 285.2 | 28.9 |
| Variable-income securities | 16.2 | 4.5 | 426.0 | 43.2 |
| Domestic | 10.5 | 2.9 | 215.2 | 21.8 |
| Foreign | 5.7 | 1.6 | 210.8 | 21.4 |
| Other | 28.9 | 8.1 | 36.2 | 3.7 |
| Net assets | 358.4 | | 986.5 | |

*Source:* Central Bank of Iceland.

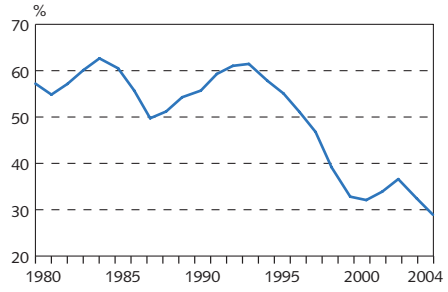


Chart 3
Loans to members as a proportion of
pension funds' net assets 1980-2004




*Source:* Central Bank of Iceland.

Chart 4
Housing finance investments as a share
of pension funds' net assets 1980-2004




*Source:* Central Bank of Iceland.

**Mortgage financing**

Pension funds have taken part in mortgage financing in Iceland in two ways. One has been by providing fund members with loans secured against residential housing, the development of which is shown in Chart 3. The pension funds' other form of involvement in mortgage financing has been through the purchase of securities that have been issued to finance the state housing loan system. This began when Act No. 54/1986 made it mandatory for pension funds to allocate a specific share of their disposable capital to buy bonds issued by the then State Housing Fund. Housing bonds and housing authority bonds were introduced in the first half of the 1990s and pension funds immediately started to invest in them. In the following years they allocated around a quarter of their disposable capital for this purpose. In 1997 there was a marked decline in these investments, coinciding with a new focus on foreign investment. When housing bond issuance was discontinued in 2004 and replaced by the Housing Financing Fund's HFF bonds, the pension funds immediately swapped a substantial share of their housing bond portfolios for the new instruments and have continued to buy them on some scale.

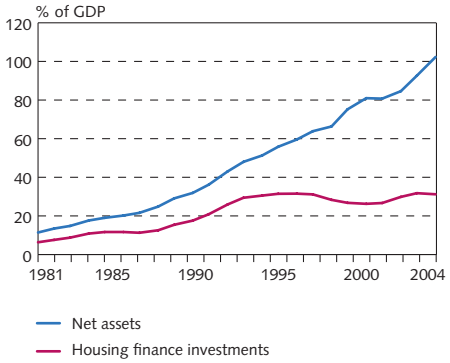
Chart 4 shows how the pension funds' housing-related investments have contracted over the past decade as a proportion of their net assets. One reason is diversified investment opportunities through access to foreign markets: also, the stage was reached where funds provided all the necessary financing for mortgages with the collateral that they and the HFF required. This was a fine investment option, but the funds had additional capital that they needed to invest.

Mortgage financing investments have remained quite steady as a ratio of GDP over the past decade at 26-31%, based on the annual average position, as shown in Chart 5. Over the same period, the ratio of net assets to GDP doubled from 51% to 102%. Pension funds hold 41% of the HFF's bond issues (housing bonds, housing authority bonds and HFF bonds) and 47% of total bonds issued on Iceland Stock Exchange (ICEX). They also hold the bulk of domestic bond issues by deposit money banks.

### Foreign securities portfolios

In the beginning of 1995, investment in foreign securities by Icelandic residents was finally deregulated in full. However, pension funds did not begin investing outside Iceland to any degree until 1997. Since then their foreign portfolios have swollen steadily to account for 22% of their total net assets by the end of 2004. The leading fund in terms of foreign investments had close to one-third of its assets in the form of foreign securities. Funds still have some scope left for foreign investment before they reach the 50% ceiling on foreign currency positions relative to net assets which is laid down in Act No. 129/1997. In effect they could invest more than 50% of their net assets in foreign portfolios if they hedge against the currency risk.

Chart 5
Pension funds' housing finance investments and net assets 1981-2004



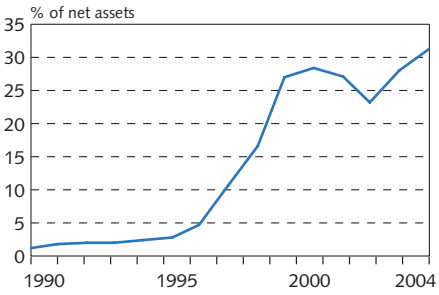

*Source:* Central Bank of Iceland.

### Equities and equity funds

By far the largest component of pension funds' foreign portfolios is in equities, both in specific companies and equity funds. For the past five years, equities have accounted for around 80% of their foreign securities portfolios and 17-18% of net assets. A downturn in equities prices, such as the global slide of 2000-2002, therefore has a considerable impact on the funds' investment returns, which turned negative over that period when price rises unwound.

Total investments in domestic and foreign equities and equity funds have surged over the past decade and a half. In 1990, they accounted for only slightly more than 1% of net assets, but by the end of 2004 had soared to 31%, as Chart 6 shows.

Chart 6
Pension funds' portfolios of equities and equity funds 1990-2004




*Source:* Central Bank of Iceland.

### Comparison with the Netherlands

Increased equity investment by Icelandic pension funds resembles the trend in other countries, for instance in the Netherlands, where equity holdings had reached 40% of total assets by the end of 2000.[6] A consequence of this changed portfolio composition has been to leave pension funds more susceptible to fluctuations in equity prices, as evidenced by their performance in both Iceland and the Netherlands.

Thus the actuarial position of pension funds in both countries deteriorated markedly over the period 2000-2003. The position of the Icelandic funds continued to decline in 2004, and at the end of that year was negative for a total of 27 of the 40 mutual pension funds (or "mutual pension divisions", as they are termed under the FME classification) that operate without external guarantees. While fluctuations in equity prices cannot be blamed entirely for the funds' poorer position, they clearly were a contributing factor.

The Dutch pension fund system resembles Iceland's in many respects. Membership is mandatory and pension funds are intended to provide a large proportion of pension payments, although less than in Iceland. The system is strongly occupational-related in that employees must be members of particular pension funds, as is also the case in Iceland. This impedes competition between funds. Supplementary pension saving schemes were launched earlier in the Netherlands, and

6. van Ewijk, Casper and Martin van de Ven: Pension funds at risk. *CPP Report* 2003/1.

by 1996 the overwhelming majority of its labour force had already entered into them. The main reference for indexation of pensions in the Netherlands is the wage index, while in Iceland the consumer price index is the norm. In spite of the strong financial position of the Dutch pension funds, problems are foreseen in connection with the growth in the number of pensioners caused by increased longevity. At the same time, the number of employed is falling. Furthermore, mobility of labour in the Netherlands entails risks for the pension funds, since employees have the opportunity to avoid funds that have been weakened by factors such as unfavourable age distribution, possibly even by moving abroad. Employees are increasingly likely to do so in order to avoid losses that may result from the problems facing many funds. In Iceland, public sector employees have long enjoyed better pension rights than private sector employees. If some general pension funds apply age-related benefit rules and others fixed rules, a new incentive is created for employees to choose jobs on the basis of the pension rights accompanying them.[7]

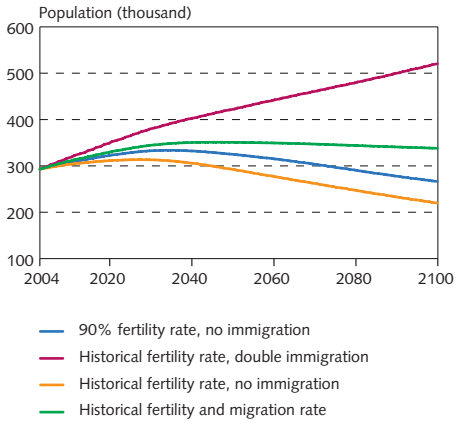
**Demographics**

Future prospects for the pension funds are contingent upon factors including the age distribution of members and their life expectancy. The base year for the following calculations is 2004, after which population figures and age distribution are projected on the basis of the fertility rate, expected mortality rate and migration. The baseline model uses averages calculated from measurements by Statistics Iceland[8] for 2001-2004 except for migration of foreign nationals, where the year 2004 is excluded as probably atypical because of large-scale aluminium industry construction projects then.

The baseline model assumes that the number of immigrants and emigrants will be the same percentage of the total population of a given age as in the measured years. This is a reasonable assumption in the case of migration by Icelandic nationals, although other factors obviously come into play, in particular the economic situation in Iceland compared with the countries to which they tend to move. No immediate yardstick is available for the number of foreign nationals migrating to or from Iceland, but the adopted rule provides as good a working model as any and entails that the pattern in 2001-2003 will broadly continue in the future.

During the reference years, considerably more Icelandic nationals emigrated than returned from abroad to live in Iceland again. On the other hand, more foreign nationals moved to Iceland than left it, so that the overall impact of migration is slight. Chart 7 shows several scenarios for population growth until 2100. It includes population growth projections based on a zero or double migration rate for foreign nationals. The fourth scenario assumes an unchanged historical rate of migration but a drop in the fertility rate to 90% of the level in 2001-2004.

Chart 7
Projected population 2004-2100




7. Gudmundsson, Gudmundur: Prospects of Icelandic pension funds. *Central Bank of Iceland Working Papers* No. 6 (2000).

8. Data from Statistics Iceland are used extensively throughout this paper. Some are taken directly from Statistics Iceland's website, but the authors would also like to thank the bureau's employees who have provided other statistics from its database.

Chart 8 shows the proportional division of the population into people of working age and retirement age. The current group aged 67 and over is equivalent to a little more than 17% of people of working age which means that, under a pay-as-you-go system, the working population would need to allocate more than 12% of their earnings in order to provide the retired with a pension equivalent to 70% of the earnings of the employed. The percentage of population of retirement age will increase according to this forecast and the cost of a pension benefit level of 70% will approach 26% of wages.

The fertility rate has been falling for some time, in line with the trend in other countries. Chart 9 presents a scenario where population growth follows the baseline assumptions except that the birth rate is set at 90% of the average for 2001-2004. This should not have much impact on the performance of fully funded pension funds, but under a pay-as-you-go system the cost of a 70% pension would be close to 29% of wages.

Longevity has been steadily increasing in Western countries due to improved living conditions and medical advances in both the cure and the prevention or delay of diseases. As the retirement age has not been increased, this is is detrimental to the pension funds' finances, as discussed later. While this trend could continue – for example, there is still scope for reducing smoking – the possibility of a halt or reversal cannot be ruled out either. Affluence encourages obesity, and a sedentary lifestyle and the emergence of new infectious diseases or drug-resistant strains of older ones could raise the mortality rate among younger age groups.

General pension funds currently pay half as much in disability pensions as in retirement pension payments. The increase in the number of disabled persons in Iceland has been much discussed, but will not be addressed here. The disability expectancy used in the present calculations and shown in Chart 10 is mainly based on data from Herbertsson (2005), with a slight adjustment for the oldest age groups where statistics showed a higher rate of disability expectancy for 60-64-year-olds than for 65-67-year-olds. This is treated as a temporary irregularity in the data and the probability is levelled out to produce an increase until retirement age.

Chart 8
Age distribution in baseline population forecast 2004-2100

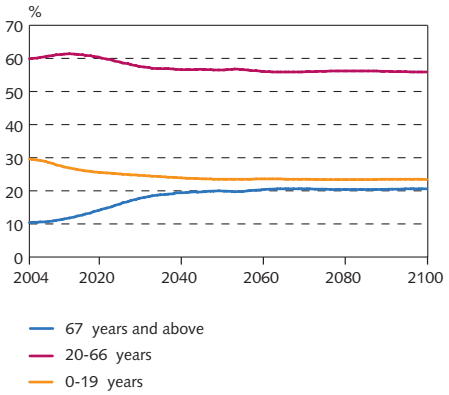
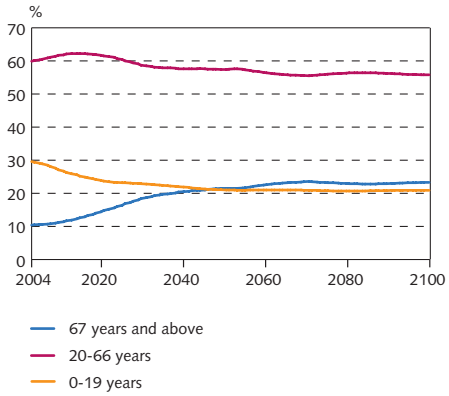



Chart 9
Age distribution if fertility rate falls to 90% of the average over 2004-2100

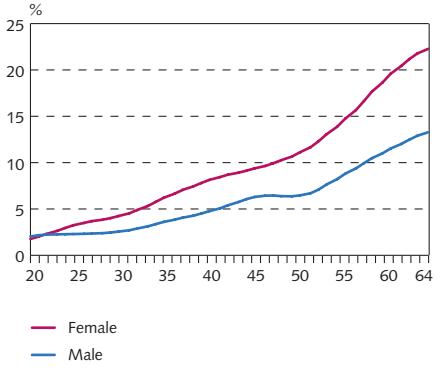



## Interest rates

Returns on domestic portfolio investments have been highly volatile over the period that pension funds have operated. Historical data have little predictive value for domestic interest rate developments and will not be discussed here. In real terms, domestic bonds currently carry higher interest rates than foreign bonds, but the margin has narrowed. The interest-rate differential with abroad is likely to shrink further with the globalisation of Iceland's financial markets. Because of the currency risk, however, as a rule interest rates may be expected to remain higher on króna-denominated bonds than on comparable bonds denominated in major currencies.

Pension rights are price-indexed and indexed bonds have hitherto accounted for a large share of the funds' asset portfolios. A report

Chart 10
Disability expectancy




*Source:* Based on Herbertsson (2005).

on the impact of indexation on Icelandic pension funds has recently been published.[9]

Foreign portfolio investments by Icelandic pension funds have grown rapidly since 1997 and their share of the funds' total assets is likely to increase even further. Returns on these investments have fluctuated sharply, as discussed later.

**Wage changes**

In the long run, changes in productivity are the main driver of changes in real wages. Parity is assumed here, although this does not strictly hold. An increase in productivity will earn people higher wages than earlier in their lives. In a system where contributions are a fixed percentage of lifetime earnings, pensions will therefore be a small percentage of the wages of the employed if productivity increases strongly. In that case, pension fund contributions would need to be a larger proportion of wages if conditions or rules are set requiring pensions to be based on wages in the labour market,

**Age-related pension rights**

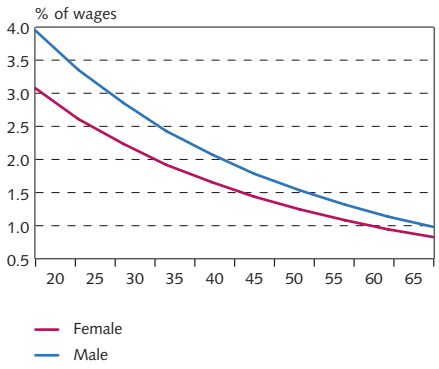
Some pension funds have adopted an arrangement whereby the pension rights which members acquire for the same contribution differ according to their age. Presumably they have opted to do so on grounds of fairness. The guiding principle would be that it is unfair if the return on invested contributions by those who join the pension fund at a young age were used to pay the pensions of members who join at a later point in their working life.

The aim behind age-related rights is for each contribution to create an entitlement corresponding to the amount of pension that it is expected to be sufficient to cover. Thus in order to evaluate the benefit level generated by a contribution at a given age, real interest rates need to be forecast until pension payments cease, along with expected mortality rate, rules for retirement age and other probable outlays that the fund might incur on account of its members.

Chart 11 presents an example of age-related entitlement. For simplification's sake, disability and retirement pensions are the only outlays assumed. The baseline assumptions for life expectancy are used, but the benefit levels are calculated separately for males and females. Survivor's pensions, which cost funds more on account of males, are not included; nor are operating expenses, which are presumably the same for both sexes. The graphs therefore show a slightly larger difference between the benefit levels generated by the respective contributions of males and females than would be the case in a real fund under current rules. Disability and old-age pensions are much larger expenditure items, however, creating a large real difference due to higher longevity of females and their greater likelihood of disability. Pensions are shown as a percentage of wages on which a 10% contribution is paid.

It is difficult to restructure pension fund arrangements without affecting members unequally. In addition to general provisions of law

Chart 11
Age-related acquisition of pension benefits[1]




1. Assuming a contribution 10% of wages and 3.5% real interest rates.

9. Herbertsson, Tryggvi Thór: *Greinargerð til Landssamtaka lífeyrissjóða* [Report to the National Association of Pension Funds], November 2004.

which might apply to them, such changes would need to fulfil requirements for minimum coverage. A switch from a flat-rate system to age-related benefits may obviously have major but varying impacts on individual members depending upon their age, which must be kept in mind during the changeover.[10] The following is an examination of the impact of various uncertainties that must be taken into account for age-related pension rights.

Calculations of the pension rights generated by contributions from a 25-year-old member need to incorporate the probable mortality rate from the age of 25-100 and disability expectancy from 25-65. The death and disability expectancies that would have been assumed 30 years ago would be inappropriate now and there is likewise little reason to presume that the current criteria are any more universal. The most serious uncertainty, however, concerns capital income.

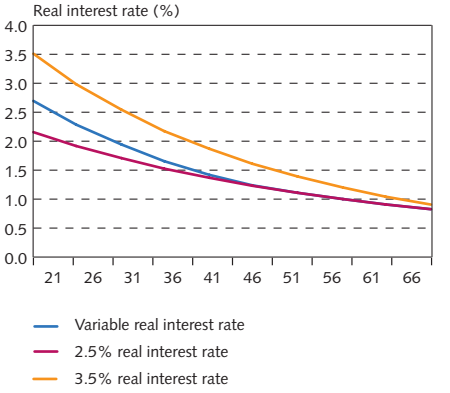
Differences in accrued age-related pension rights are determined by real interest rates. In order to calculate how benefits change according to age, the real interest rate curve needs to be known from the time that the contribution is paid until the last pensioners from that age group die. The age-related pension rights that are currently being generated are based on the pension funds' projections for real interest rates until beyond the year 2080. In Iceland, a real interest rate of 3.5% is customarily assumed in long-term forecasting. Chart 12 shows the average curves calculated for males and females based on three assumptions for real interest rates. The uppermost and lowest curves show the outcome assuming real interest rates of 3.5% and 2.5% respectively. The centre curve shows the rights generated if the interest rate is lowered by 0.1 percentage point annually from 3.5% to 2.5% after the age of 40, then set at 2.5% from 50 onwards.

Pension funds lack the knowledge required to forecast interest rate changes such as those assumed for the centre curve 20 years ahead. A more probable forecasting approach under these conditions would be to assume an interest rate of 3.5% until it began to fall. It is assumed here that the drop and subsequent constant rates of 2.5% are forecast correctly.

A drop in interest rates requires pension funds either to reduce pensions or increase contributions, regardless of whether the benefit level is fixed or age-related. Since the pension funds' scope for achieving balance by lowering the pension amount is limited by legal provisions on minimum pension, the following examination is confined to the option of raising contributions.

If contributions are raised to counter lower investment returns for a fund applying flat-rate benefit rules, the most obvious course would be to set the new contribution so that it earns the same number of pension points for the same wage as under the older rate, thereby leaving the pension unchanged as a percentage of wages. Those who already are retired will retain their original pension amount without making additional contributions. In this way, all members receive the same pension for the same lifetime earnings, but the younger ones will pay higher contributions for the same benefit level. A partial justification for the

Chart 12
Age-related acquisition of pension benefits[1]



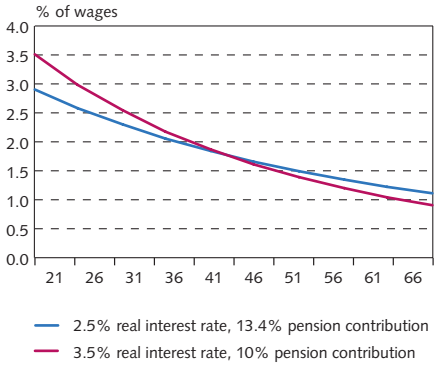

1. Based on average mortality and disability expectancy for males and females, a pension contribution of 10% of wages and three assumptions for real interest rates.

10. Gudmundsson, Bjarni. 2004

relative advantage enjoyed by older members under this arrangement is that the contributions they have already paid, which granted them a proportionally higher benefit level than will be earned by the contributions remaining to be paid, have been invested at a higher return than can be expected on securities purchased in the future.

Let us now examine the case of a fund applying age-related pension rights. In order to establish a precise age-related benefit level, the reference interest rate curve would need to be altered continually to match changes in interest rates, although it would probably suffice to do this less frequently. Lower interest rates reduce the degree of changes in age-related benefit levels. The obvious approach would be to set the rate of contributions, after a change in interest rates, so that a member who participated in the scheme from the age of 27 would receive the same pension as before the change. This is shown in Chart 13, where one curve shows the benefit level before the change in interest rates and is the same as the uppermost curve in Chart 12. The other curve is based on an interest rate of 2.5% and a contribution of 13.4% towards retirement and disability pension, which provides the same benefit level as the upper curve, assuming that contributions are paid for 40 years, and that wages remain unchanged over time and irrespective of the employee's age. However, this increase in contributions is inadequate for the fund. A member aged 40 at the time of the changeover may have contributed to the fund for 20 years. He would have accrued rights based on a forecast constant future interest rate of 3.5% and has built up a large share of the benefit level that he was set to attain under the earlier rules on age-related pension rights and contribution rates. However, the change in interest rates shifts his benefit level to a different curve where a higher percentage is accrued later on during his working life. This employee's total pension will therefore be higher than assumed according to either curve. His contribution is insufficient to pay such a pension. An obvious solution would be to reduce the accrued benefit level by a given percentage immediately that a new curve for the age-related benefit level takes effect.

Chart 13
Two paths for age-related acquisition of identical pension benefits




Consider now a fund member who is approaching retirement age and has accumulated pension rights all his working life under an age-related scheme that assumed a 3.5% interest rate throughout. This would grant a higher benefit level at first than under the new curve but a lower level later on, and his total entitlement is consistent with the fund's targets. This particular member would suffer an unexpected cut in pension income but have no scope to respond by increasing his personal savings. If the fund's benefit levels are close to the minimum mandatory requirement, it would actually be illegal to reduce his benefit level.

The interest rate change in this hypothetical example is smaller than those which pension funds have experienced hitherto or may expect in the future.

## Future prospects

**General pension funds**

A model has been designed for a fund which broadly resembles the general pension funds, using contribution and pension payment data

corresponding to real values for 2004. The model can be used to forecast the development of the funds and examine factors that affect them. Life expectancy and fertility rates follow the baseline model described above unless otherwise stated. The breakdown of income is based on data compiled by Statistics Iceland from tax returns, which should therefore correspond closely to the income from which pension fund contributions are paid.

The model assumes that fund members start paying contributions at the age of 18 and retire at 67. Average income figures include all those who file tax returns for income from paid employment and presumably give a reasonable picture of a situation in which many of the younger year groups attend school. Some members retire before the age of 67 and others later, but persons receiving only pension income are excluded from calculations for average income, so that the figure used should also be quite appropriate.

The general pension funds' income from contributions in 2004 corresponds to payments being made by 83.8% of people of working age, and this figure is used in the projections.

Calculations of disability and retirement pension rights assume that the fund began operation in 1970. Funds did not include the self-employed until 1980. Initially, contributions were paid only from basic daytime wages, but contributions from overtime pay were phased in over 1987-1990. Benefit levels which the contributions would provide were supposed to track wage developments, but price-indexation was eventually adopted. By calculating the benefit level according to wage developments and assuming a linear development from 1970, estimated accrual of pension points and payment of contributions on 83.8% of income from employment, the model fund should have paid 15.4 b.kr. in pensions in 2004. In actual fact, the general funds paid just under 9.9 b.kr. The main explanation for the discrepancy is presumably that contributions were not paid on certain income. For projections, the benefit level from the starting date in 2004 and its distribution across age groups need to be known. All the above calculated pension points from prior years were reduced by 6.7% with an additional 2% annually from 2003 back to 1970, to match the historical amount of pension payments for 2004.

Disability pension is based on accumulated benefits and estimated benefit levels until retirement age had the disability not occurred. On the assumption that a 100% level of disability was involved in all cases, calculated pensions amount to 13.3 b.kr., compared with the 4.5 b.kr. actually paid by the funds. The funds pay pensions to members with 50-100% disability, but it is clear that their benefit level is much lower than would be estimated from average wages and benefits. For projections of disability pensions, the method of calculation is therefore retained but multiplied by the ratio of paid to calculated benefits in 2004.

Table 3 shows a number of projections based on the above model. All amounts are stated at constant prices based on the level in 2004. Productivity and wages are assumed to rise by 1% annually in excesses of prices. Contributions are set at 11% of wages in 2005 and then calculated so that the benefit level from that year inclusive

Table III Contributions, total assets and old-age pensions as % of income from employment.[1]

| | *General pension funds* | | | | | *Individual pension schemes* | |
|---|---|---|---|---|---|---|---|
| | *Contribution, % of wages* | *Total assets b.kr.* | *Total assets b.kr.* | *Old-age pension, % of wages* | *Old-age pension, % of wages* | *Total assets b.kr.* | *Total assets b.kr.* |
| Year | | 2015 | 2025 | 2015 | 2025 | 2015 | 2025 |
| Baseline model | 12.0 | 1,477 | 2,213 | 0.322 | 0.396 | 399 | 684 |
| Interest rate cut from 3.5% to 2.5% | 15.3 | 1,653 | 2,549 | 0.322 | 0.396 | 396 | 652 |
| 2% productivity increase | 12.3 | 1,534 | 2,429 | 0.295 | 0.343 | 415 | 750 |
| Average lifespan prolonged by 1 year | 12.7 | 1,516 | 2,305 | 0.322 | 0.396 | 399 | 686 |

1) The baseline model assumes a real interest rate of 3.5%, a productivity increase of 1%, and the same life expectancy as in the baseline model in Chart 7. The baseline model assumptions are used in the other projections, but with one variable changed.



is 1.4% of wages and that the fund and future contributions to it will exactly cover the current benefit level of members and the benefits that they will earn in the future. No new membership is assumed in these calculations, but added in the following projections.

In pension funds today, benefit levels are either fixed, as assumed here, or age-related. Both systems have a fixed contribution rate for all age groups and must fulfil legal requirements for minimum coverage. The size of the funds and final pension amount should therefore not be affected by the simplifying assumption of a fixed benefit level.

The contribution in the baseline model must be 12.0% after 2005. As the calculations are based on the minimum permissible benefit level, the model fund's performance is probably marginally poorer than shown by the real funds. Several explanations are possible, including the real funds' rather more favourable age and sex composition compared with the hypothetical model, since more women belong to the public sector pension funds than the general funds, and employees start working there later in life. The model assumes the same number for each age group and sex as in total figures for the entire population. The development of the fund based on 2004 prices is shown in Table 3. It grows from 740 b.kr. in 2004 to 1,400 b.kr. over the next 10 years. The average benefit level of this year's retirees is roughly 22% of the wages of the working population aged 40-60. In 2015 these benefit levels will reach 32% and almost 40% in 2025, heading towards 46%.

In addition to the baseline model, three scenarios are given with one variable changed in each and the others the same. In one scenario real interest rates undergo a linear reduction from 3.5% to 2.5% over the period 2010-2029, then are kept constant at 2.5%. Another scenario assumes a 2% increase in productivity and the third a change in life expectancy whereby fund members live on average one year longer than assumed in the baseline model. As may be seen in Table 3, an interest rate cut of one percentage point requires the contribution to be raised by 3.3% of wages, producing considerable growth in the funds' size. Changes in productivity and corresponding wage increases have little impact on contributions as the legal provision on minimum coverage is interpreted here. However, they do have a substantial effect on the ratio between the incomes of pensioners and the employed.

**Individual pension saving schemes**

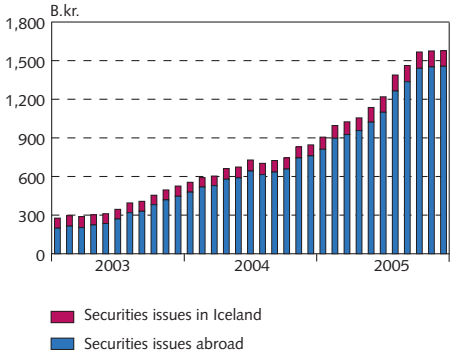
Individual pension saving funds held assets of 110 b.kr. at the end of 2004 and their income from contributions that year was 17.3 b.kr. This figure includes savings schemes offered both by pension funds and other financial institutions. Under current agreements for supplementary pension saving plans, an employee may make a voluntary contribution equivalent to 2% of wages which must then be matched by the employer. This arrangement is so beneficial for employees that participation is likely to increase even further. The assumptions for a model to evaluate the future development of savings funds are more uncertain than for general funds. Although the majority of the population of working age has now joined savings funds, they are not mandatory. The sex and age distribution of neither the contributors nor present deposit holders is available.

Scheduling of payments from individual pension saving schemes is highly uncertain. Members may withdraw pension as an annuity between the ages of 60 and 67. After that age, remaining savings may be withdrawn in a lump sum or converted into a lifelong annuity. Thus the savings funds have certain features of mutual pension funds. (It will be a tough actuarial challenge to determine the amount of a lifelong pension. By the time that members choose whether they want to exercise that option or withdraw the whole deposit, they will have a good idea about their life expectancy. Many who do not have long to live will know that their life expectancy is low and will withdraw their savings immediately. Others with no symptoms of serious illness and a family history of longevity may opt for a pension for the rest of their life. Statistical life expectancy is thus an inadequate criterion for calculations).

Individual pension saving funds will be smaller than mutual pension funds for the same contribution. They pay out the accumulated savings of those who die or become disabled before they reach retirement age, and old-age pensions of retirees who decide against a lifelong pension are paid out much earlier than by mutual pension funds. Projections divide the assets of individual pension schemes as of 2004 among the population in proportion to the average income of each age group and sex. The contribution in 2004 corresponds to an average of 3.7% of wages and this ratio is used in the projections. Nonetheless, little is known about how members will choose to withdraw their deposits. The scenario presented here shows the pension amount and size of the fund based on withdrawal of the entire deposit at the age of 67. The deposit would be lower and the fund's total assets correspondingly smaller if all members started to withdraw their savings at the age of 60. Conversely, the fund would be larger and its pension payments higher if all members contributed over a full working life and then converted their savings to an indexed lifelong pension plan.

Mutual pension funds with employer guarantees held assets of 166 b.kr. at the end of 2004. Large as these assets may seem, they still fall far short of meeting the funds' commitments. The central and local governments guarantee these commitments and decide to what extent they set up funds to cover pension payments or whether to operate them on a pay-as-you-go basis out of their own tax revenues. No model is proposed here to estimate the size of these funds in the coming years.

Chart 14
Deposit money banks' securities issues
January 2003 - September 2005




*Source:* Central Bank of Iceland.

**Allocations by the pension funds**

Over the next 10 years the Icelandic pension funds will need to invest around 1,000 b.kr. at present price levels, or close to the value of one year's GDP, over and above their current assets. By comparison, Norway's Government Pension Fund (Petroleum Fund) is equivalent to around 60% of that country's GDP. The main investment options will be examined below.

Mortgage lending by pension funds has been quite stable over the past decade as a ratio of GDP, at 26-31%. Over the same period their net assets relative to GDP have doubled from 51% to 102%.

Banks started offering mortgage loans with new and easier terms in August 2004, prior to which they had only lent against property on a small scale. By the end of September 2005 their outstanding stock of new mortgage loans was 281 b.kr. The HFF has financed part (27%) of the bank's lending by purchasing loan agreements from them. Banks appear to have financed the remainder of their mortgage lending with bond issuance abroad. From the launch of bank mortgage loans in August 2004 to the end of September 2005, their foreign bond issues increased by 798 b.kr, see Chart 14.

The changes in the mortgage market brought about by the banks' initiative were so sweeping and swift that their effect on domestic lending by pension funds remains unclear. Long-term mortgage loans are well suited to pension fund operations. With a 65% loan-to-value ratio they represented a particularly safe investment. By raising the ratio to 90-100% and lowering mortgage interest rates, the banks captured a substantial share of this market and expanded it at the same time. However, a 90% loan-to-value ratio pushes these loans into a high risk category[11] – Landsbanki Íslands has since brought it back down to 80%. Pension funds could back up the banks in their mortgage activities, but would then have to compete with foreign capital markets for interest rates.

Pension funds are already very active in the domestic market. They own around 12% of all equities listed on ICEX. Of total market bonds, they hold around 47%. For example, they hold 41% of all bonds issued by the HFF (housing bonds, housing authority bonds and HFF bonds), compared with 32% held by the banks. It is therefore not immediately obvious what domestic investment opportunities are available to pension funds for deploying the large funds they will have at their disposal over the coming decades. A likely candidate for investment would be large-scale power projects. In its annual report for 2004, Landsvirkjun (the national power company) reported liabilities of 102 b.kr. and equity of 51 b.kr. Construction cost of the Kárahnjúkar hydropower plant with an installed capacity of 690 MW is roughly 90 b.kr. Since the combined capacity of other Landsvirkjun power plants is 1,215 MW, they would seem to be undervalued by the accounting methods adopted.

Another option that might be available would be for banks to increase their domestic issuance of bonds and sell them to the pension funds. As shown in Chart 14, the banks have focused on bond issu-

11. Gudmundsson, Gudmundur (2005): Risks in higher loan-to-value ratios of housing. *Monetary Bulletin* 2005/2, 57-62.

ance in foreign markets, where over 90% of their issues have been made. The pension funds already hold the bulk of the banks' domestic issues so far. The implication of these potential domestic opportunities is that pension funds will gear up their investments abroad. Thus returns on foreign securities will be crucial for their future.

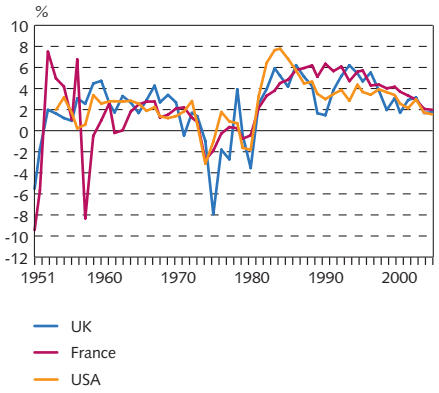
Iceland's investment requirement is not different from that of comparable economies. Building up the Icelandic national pension system seems impossible without large-scale investment abroad. Thus establishing a global pension system (or even for only the more affluent countries) along these lines is out of the question, because there would be no way to build up the requisite funds. However the current level of pension saving could probably be increased sharply in many countries.

Icelandic pension funds have not bought foreign bonds to any degree. The reason is that ever since they started investing abroad, real interest rates on foreign bonds have been significantly lower than those on Icelandic bonds. Chart 15 shows real interest rates for Treasury bonds from three countries. In recent years they have been under the reference rate for long-term returns of 3.5% p.a. on which the pension funds' contributions and benefit levels are based. Historical experience does not suggest that rates are likely to rise to a sustainable long-term level of 3.5%. When interest rates were considerably higher in the 1980s, this was explained by the huge US budget deficit then. Afterwards they fell back and are still low in spite of the huge fiscal deficit now. There is no discernible trend in real interest rates on US Treasury bonds over the past half-century (1957-2004) – their estimated average interest rate is 2.7% with a standard deviation of 0.7%. This means that even if the features of the real interest rate curve are assumed to remain unchanged, a 95% confidence limit leaves the annual mean value in the range 1.4-4.0%.

Foreign investments by pension funds have mostly focused on equities. Chart 16 shows several international share indices. Chart 17 shows the rise in share indices for three countries in real terms, deflated with the CPI. An estimate of average US equity price rises for the same years as the Treasury bonds shows an average increase of 2.7% in real terms. There are no indications of any change in the mean value or irregularities in the data series. Given that equities also earn dividends, this would have been an acceptable investment. (By extending the sample to include 1955 and 1956, the average increase would have been 3.6%). However, the standard deviation is 2%, leaving a 95% confidence limit in the range -1.3% to 6.7%. The reason for this high degree of uncertainty for the average increase even across such a long series is the irregular character of equity price changes. Some scope is at hand for regularising returns by diversifying investments across countries and currencies, but as the graphs show, equity price changes are so strongly correlated that diversification has only a limited impact. The history of returns on US stocks has in fact been traced back to 1802 and they have normally been high (Siegel 2002). But given the high degree of irregularity, the above figures indicate the magnitude of inaccuracy in the 50-year forecast for average investment returns.

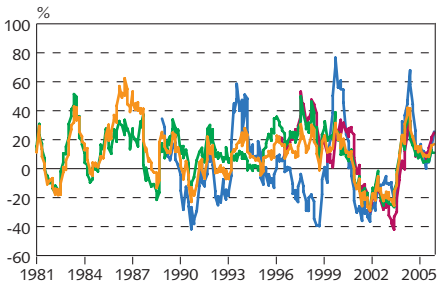
Limited investment opportunities in Iceland make it foreseeable that foreign securities will account for a growing proportion of the

Chart 15
T-bond real interest rates 1951-2004



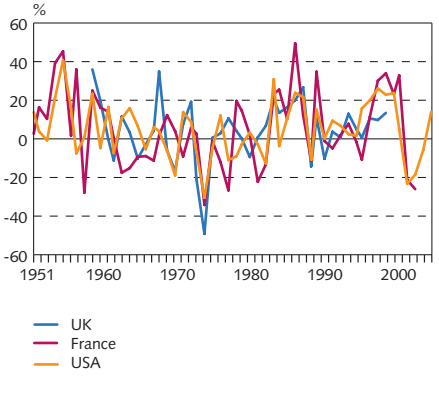

*Source:* IMF-IFS.

Chart 16
MSCI indices January 1981 - September 2005
12-month increase




*Source:* Bloomberg.

Chart 17
Equity price increases in real terms 1951-2004
US and UK indices are for manufacturing sector only




*Source:* IMF-IFS.

pension funds' total assets. It is worth pondering the impact on the funds if they were to exercise in full their statutory authorisation for investment in equities, which sets a ceiling at 50% of their net assets – in particular given the impact of the burst equity bubble in 2000-2002, even though only 27-28% of the funds' net assets were invested in equities at that time. At the end of 2004, around 31% of the pension funds' net assets were invested in domestic and foreign equities. When the 50% limit has been reached, and assuming that the legal framework remains unchanged, they will have to turn to foreign bonds or mutual funds that invest in bonds in order to generate returns.

Although data for the past half-century give no particular indication of a change in the character of real interest rate curves for Treasury bonds or in the real value of equities in advanced economies, it would be imprudent to place too much faith in the predictive value of that period for the coming half-century.

The pension situation in the advanced economies (and also India and China) will probably have a substantial impact on returns on capital for both bonds and stocks (Saarenheimo, 2005). Measures to increase the level of saving in pension systems have been advocated which would lead to the creation of funds that demand securities, causing interest rates to drop. The public is likely to foresee a cut in pensions from the public systems, prompting people to try to save for their old age with the same effect as establishing pension funds. Governments could, at least in the short run, pay for old-age pensions by issuing bonds, which would drive up interest rates on them.

Industrialised countries have experienced robust economic and productivity growth during the period that Icelandic pension funds have been operating, but considerable fluctuations can be seen over shorter periods. Technical advances and peace are important explanations for economic growth. It seems natural to assume that both will continue in the years to come.

One factor driving the economic growth that has prevailed since even before the Icelandic pension funds began operations has been non-sustainable energy consumption. After being forecast for decades, oil shortages are now starting to be felt. Consumption of oil and of coal, which is in large supply, also create problems because of the greenhouse effect. In addition to changes in age distribution, tighter supply of energy and higher prices for it are among the surest factors in forecasts for how the economic climate will alter over the next few decades. The effect will be to dampen economic growth and, other things being equal, slice into business profitability and equity prices. But more expensive energy will also stimulate significant changes in production methods, communications and housing. For instance, less energy is required to catch cod by longlining and netting than by trawling. Energy consumption can also be reduced by sharing cars. Such changes call for investment and capital, which will contribute to higher interest rates. The global energy shortage raises the value of Iceland's sustainable energy resources, which are in much larger supply than the present population needs. Migration will probably even out the difference in national income per capita between Iceland and Europe.

## Saving

If the pension funds' forecasts of 3.5% real interest rates hold, Iceland's pension outlays of roughly 12% of wages to mutual pension funds, 4% to individual pension saving schemes and the cost of pension paid by the State Social Security Institute will be much lower in total than would be needed to secure the same pension under a pure pay-as-you-go system. In fully funded funds, age distribution is not of great importance, but high retirement age and capital income are the most important factors in keeping down the cost of pension payments. Funds grow for as long as members reach retirement age without having attained full benefit levels. Subsequently the size will change in pace with population developments, age distribution, productivity and adaptation to interest rate changes.

The Icelandic pension fund system represents huge monetary savings by individuals of working age. After the funds ceased to provide members with non-indexed loans at negative real interest rates, their return on investment has generally been strong. However, it is not self-evident that an acceptable return on a pension fund's investments will lead to the saving of real valuables. Savings are the difference between income and consumption. In the national accounts, saving is also roughly equivalent to the sum total of investment and the current account balance. A straightforward measure of the effect that pension funds have on saving is to study the allocation of their funds – whether lending is deployed on consumption, direct investment or foreign portfolio investment. Their relatively large size makes Icelandic pension funds a major force in domestic financial markets. Individuals who trust in pension funds to provide for them in their retirement need not save for their old age themselves. The pension funds' ultimate effect on saving cannot therefore be measured by studying only how they allocate their capital.

Let us look at the saving levels in countries with different pension systems. France, Italy and Germany are affluent European nations with small pension funds and are greatly concerned about the future of their pension systems. Average saving as a proportion of national income for these three countries from 1990 to 2003 was 20.4%, 20.9% and 22.3% respectively.[12] The Netherlands, on the other hand, had built up comparable pension funds to those of Iceland as a ratio of national income, and had an average saving rate of 25.4%. The Icelandic pension funds grew rapidly over this period, as Chart 1 shows, while average national saving amounted to 17.8% (and 15.2% and 13.9% in 2004 and 2005 respectively, according to preliminary figures and a Ministry of Finance forecast).[13]

Pensions of Icelandic wage earners have been low because they had not built up substantial benefit levels. Accordingly, they have hardly had less reason to save than members of the pay-as-you-go systems of other countries with generous pension schemes. Other factors affect national saving besides a country's pension system, for instance age structure (Herbertsson and Zoega, 2002). Compared with

12. International Monetary Fund (2005). *International Financial Statistics*. IMF 2005.
13. Ministry of Finance: *The Icelandic Economy 2005-2010*. October 2005.

the other European countries cited here, there were more people in Iceland under working age, and fewer people who did not work because of old age or unemployment.

To give a measure of a normal contribution by pension funds towards saving, total pension contributions to the funds amounted to 75 b.kr. in 2004 and their pension payments 31 b.kr. Since part of the pension should be met by the funds' return on invested capital which the pensioners had already accumulated, the difference of 44 b.kr., or 5% of national income, represents an underestimation of the saving that should be taking place. The above figures for saving ratios in countries with different pension systems do not indicate that Iceland is saving up more for old age than is the norm in any affluent country.

**Conclusions**

The Icelandic pension system is heading towards asset holdings of more than double the value of one year's GDP. Considerable uncertainty surrounds future pension system performance. The most important issue is the return on investments, because changes in it of a similar magnitude to the estimated uncertainty will have a major impact on the level of contributions required to meet the pensions that the funds are expected to pay. Changes in life expectancy and disability expectancy will have some effect, although these are not as crucial as the uncertainty over investment returns. There is no indication in the national accounts that monetary saving by the Icelandic pension system has contributed to the saving of real valuables over and above the norm for countries that finance their pensions through taxation.



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