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**Volatility in Superannuation
Investments and the Australian Age
Pension**

by

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Volatility in Superannuation Investments and the Australian Age Pension

This paper considers how recent changes in superannuation investment strategies may affect the proportions of retired Australians who receive a part or full age pension.

Over recent years, there has been a trend towards giving superannuation members ever more choice of investment strategy for their superannuation accounts. Members can now typically choose between a number of options, such as “cash”, “balanced” or “growth”; or sometimes they can direct varying proportions of their total account into each of a number of broad asset classes. The introduction of member choice of fund introduces scope for even more control over investment strategy. Members will now have the potential to direct the superannuation contributions made on their behalf into very specialised investment vehicles. The legislation requires that due attention is paid to diversification, but in practice the end result may be a very low level of diversification.

This reduced diversification can be expected to result in an increase in volatility of superannuation investments. Furthermore, there is scope for a much wider variation between the investment returns achieved by different people. At the moment, many members are in the default option or have chosen a balanced option, and these options do not vary greatly across the market of superannuation investment managers. If we see members exercising their choice to concentrate their holdings in particular classes, or segmenting into more or less conservative choices, we will see more differences between individuals. This may in turn have implications for the cost to the state of providing the age pension, which, because of the means test, serves as a safety net for those whose superannuation accounts may come out on the losing end of this increased volatility.

A recent APRA study [1] focussed on “do-it-yourself” superannuation funds of the type described as “Small APRA Funds” (SAFs). The characteristics of these funds may indicate what could happen if members of larger funds exercise their right of choice of fund to gain greater control over their investment strategy. In the case of SAFs: “The members of the SAF (possibly in consultation with their financial advisor) decide on their investment strategy and asset allocation, which is then communicated to the Approved Trustee for execution. The investment choices of the fund members are limited by the requirement that the Approved Trustee ensure that investment decisions are ‘appropriate’ to superannuation.”

The study found that over the seven years to 2003, the average SAF had annual net return on assets of 7.55% and volatility of 11.41%. There was a strong correlation between the size of the fund and its return and volatility. The small SAFs (with total assets less than \$100,000) had a mean return and volatility of 4.30% and 14.79% respectively, compared with 8.82% and 10.33% respectively for the large SAFs (with total assets greater than \$500,000). The study also commented on the large dispersion of returns – eight to 16 percentage points – between SAFs at the 25th and 75th percentile, which it considered

“may be due to limited diversification opportunities for smaller funds and/or the fact that investment strategies are likely to vary widely across SAFs.”

If some of the members of large schemes use member choice of fund to exercise discretion over investment allocation in a similar way to existing members of SAFs, then the figures quoted above support our view that the introduction of member choice of fund will lead to a greater diversity in fund performance. As a result, there will be a much greater range in size of retirement benefits.

The interaction of retirement benefits and the Age Pension

We now consider the effect of this greater diversity of investment incomes on the interaction between superannuation benefits and the Australian age pension. Our first thought was that the operation of the means test on the Australian age pension would effectively provide superannuation fund members with a put option. If their superannuation assets do well, they gain all the upside. If the investments plummet in value, the age pension cuts in. For those on modest incomes this would give the opportunity to gamble with other people’s (taxpayers’) money.

However, this is only part of the picture. Consider two extremes: people whose projected superannuation payout is so low that they will receive the full age pension, and people whose projected superannuation payout is so high that they will receive no age pension. For the first group, the effect of gambling with their superannuation cannot increase their pension from the state, since it is already at a maximum, but can reduce it, through the operation of the means test, if the gamble pays off. So, if we regard the state as a body which would prefer to minimise its age pension obligations, it makes sense for the state to encourage low income earners to gamble with their meagre superannuation savings.

For the second group, a successful gamble will not affect their non-existent age pension, but an unsuccessful gamble may reduce their superannuation assets to the point where they become eligible for a part or full pension. So, again from its own perspective, the state should discourage gambling by these relatively wealthy superannuation members. Thus the effect of increased volatility depends on what the person’s age pension would be under the status quo.

Projection model

To illustrate the effects for those between the two extremes of full age pension and part age pension, we have made some simple projections modelling the effect of differing levels of volatility.

We assume a 30 year-old male commencing 35 years of unbroken employment. Superannuation contributions of 9% only are paid by the employer, taxed at 15%, and

converted into a single life CPI-indexed pension at 65 at a cost of \$17.40 per \$1 of pension (the current conversion rate offered by the Unisuper scheme for accumulation members). Insurance and administration costs are ignored. We consider two levels of starting salary: \$50,000 or \$100,000 in 2005 dollars.

The age pension for a single person, in 2005 dollars, is assumed to be \$12,535 pa less 40% of income between \$3,172 and \$34,508, and zero for those with an income over \$34,508. We have assumed no change in the social security legislation, which may of course be the most heroically bold assumption of all.

The members' salary, the age pension and the means test limits are all assumed to increase by 4% pa. Investment returns are assumed to vary from a "base case" of 6.5% mean and 7% standard deviation for net investment return. This has been chosen to reflect the typical "balanced" fund, based on the recent experience reported in Coleman et al [2].

We have assumed investment returns follow a log normal distribution and returns in each year are independent. This is a very basic model but we believe it is sufficient for the purposes of illustration. We also assume for simplicity that contributions are paid annually in advance.

Results from a balanced portfolio for a salary of \$50,000

Table A in the appendix shows the results (for 10,000 simulations) for various combinations of expected annual return and standard deviation of annual return for a person earning \$50,000.

In the base case, all members are projected to receive a part age pension, averaging 71% of the full pension. After taking into account the age pension, there is a 90% probability (on our assumptions) that the total retirement income will lie between 37% and 49% of final salary. This is a considerably narrower range than the 90 percentile range for income from superannuation only, of 16% to 36% of final salary. This shows how the means test on the age pension helps to dampen the effect of volatility of superannuation returns.

Effect of splitting members of the balanced fund into "defensive" and "growth" funds

Now we will consider the effect of choice of investment strategy. Let us assume that the balanced portfolio is made up of 50% "defensive", and 50% well diversified "growth" assets, with net investment returns respectively of 5% mean/ 1% standard deviation and 8% mean/ 13.8% standard deviation. (These figures assume a correlation coefficient of about 0.2 between defensive and growth asset returns, but given the low volatility

assumed for the defensive portfolio, the results would not be too different assuming a higher or lower level of correlation.) Now suppose that instead of a group of members all invested in the balanced portfolio, the members divide into two equal groups, one invested solely in defensive and one solely in well diversified growth assets. Overall the same assets are held as in the balanced fund, but there are now two groups of members experiencing two different levels of volatility. The results are shown in the next two lines of Table A.

The defensive investors have very little uncertainty about their total retirement income, which is now very likely to fall in the narrow band of 38% to 39% of final salary. The growth investors have only slightly more downside spread, dampened even further after taking into account the age pension, and an enhanced upside, with the 90% probability range now covering 35% to 68% of final salary. From the state's point of view, the defensive group will almost certainly receive larger age pensions than before, and the growth group will have a small chance of a larger age pension but a good chance of a smaller age pension. The average age pension for both groups together is the average of 81%, the average for the defensive investors, and 60%, the average for the growth investors. This works out at 70.5%, almost exactly the same as for balanced portfolio.

The outcome of allowing choice of investment strategy at this level of salary and contribution level is therefore neutral from the state's point of view as a provider of the age pension. The members who opt for defensive assets are arguably slightly worse off, on our assumptions, as they are sacrificing ten percentage points of upside (the difference between the upper 95 percentile values of 39% of final salary from the defensive strategy and 49% of final salary from the balanced strategy) to save only one percentage point of downside. However, from their personal point of view, the enhanced security may be worthwhile to them. The members who opt for growth are arguably better off, gaining 19 percentage points of upside at the expense of only two percentage points of downside.

Note: while there is a wide range of possible outcomes from the distribution of investment returns, we should not lose sight of the fact that only one set of overall economic conditions will be experienced over the working lifetime of a particular cohort. In our base case, we assume that all these workers retire on exactly the same income, since we assume that they all earn the same and receive the same percentage superannuation contribution which is invested in the same universal balanced portfolio. The state will pay each one the same age pension, although the amount of that age pension will vary depending on the economic events experienced over the 35 year period. Once we allow for choice of investment strategy, we assume that the workers divide into two groups. So the state will end up paying out two rates of age pension, one to the defensive investors which is likely to be close to 81% of a full pension, and a different, less predictable but very probably lower rate to the growth investors. The state's total payout will be slightly higher for a cohort who experience unfavourable conditions, and slightly lower for favourable conditions, compared to the base case.

Results from a balanced or split portfolio for a salary of \$100,000

We now repeat the analysis for a starting salary of \$100,000. Table B in the appendix shows the results. This can also be regarded, from the age pension point of view, as equivalent to keeping the salary the same and doubling the net contribution rate. So results for say a salary of \$50,000 and contribution rate of say 12% would lie between the results in Table A and Table B.

As a percentage of final salary, the projected income from superannuation is of course unaffected by the doubling of assumed salary (slight differences in the ninety percentile range arise only from the randomised projection process), but the relative contribution from the age pension is much reduced. The dampening effect of the means tested age pension is slightly reduced.

In the base case, the majority still receive a part age pension, but the pension is reduced and 6% do not receive it at all. The average age pension is 34%. For those who opt for the defensive strategy, the age pension average increases to 51%, and for those who opt for the growth strategy, the age pension average decreases to 25%. The average over all members is 38%. This is above the base case of 34%, but only slightly. So again, as in the \$50,000 salary case, the outcome of allowing choice of investment strategy at this level of salary and contribution level is roughly neutral from the state's point of view as a provider of the age pension.

Results of choosing a less diversified growth portfolio

We now consider the case where less diversification of investments within the growth sector increases the volatility of returns. Let us suppose that the well diversified growth portfolio is now replaced by a strategy with a more restricted range of investments, having the same expected return of 8% pa but a higher standard deviation of return of 20% pa. This is clearly a less efficient portfolio, as the greater volatility has been accepted without any compensating increase in expected return. The results are shown in the second line of Tables C and D.

Despite its inefficiency, this portfolio appears to be quite an attractive option for members on salaries of either \$50,000 or \$100,000. After taking into account the age pension, by shifting into the less diversified growth category from the well diversified growth strategy, both groups gain about 16 percentage points of greater upside (within the ninety percentile range on our assumptions) for the sacrifice of about three percentage points greater downside. The downside shift is reduced by the operation of the means test on the age pension, whereas the upside shift is unaffected.

The cost of this benefit flows through to the state in the impact on the age pension. The lower diversification increases the average age pension from 60% to 63% of the full rate

of pension for a member on a salary of \$50,000, and from 25% to 35% of the full rate of pension for a member on a salary of \$100,000.

Results of choosing a poorly performing high risk portfolio

We now consider the effect of a poor investment strategy, where the portfolio has the higher volatility but lower expected return than the well diversified growth portfolio. While there are probably a great many ways to invest superannuation assets to achieve remarkably poor results, we have restricted this projection to a relatively conservative assumption of a 5% pa mean rate of return with standard deviation of 20% pa. This does not appear unreasonable compared with the average results for small SAFs [1]. The results are shown in the last line of Tables C and D. Not surprisingly, the results are not as attractive as the well diversified strategy, with increased downside and decreased upside. While few people would deliberately choose such a strategy, it could easily be the unintended result of a do-it-yourself approach, with its extra investment costs and limited diversification.

This poor choice has a noticeable cost to the state in the impact on the age pension. Compared to the well diversified growth option, the average age pension increases from 60% to 81% of the full rate of pension for a member on a salary of \$50,000, and from 25% to 57% of the full rate of pension for a member on a salary of \$100,000, ie more than double the original amount of age pension.

Conclusion

The figures indicate that the means test on the age pension does indeed create the effect of a put option for superannuation members who are inclined to seek extra risk on their superannuation investments, and that this could impose a noticeable cost on the state. The impact is not great when members switch from balanced funds to well diversified investments in broad classes, but increases as the investment options become less efficient, ie as the members take on more volatility without being compensated by expected higher returns.

Areas for further research

We have not considered the impact of tax on retirement income, which would help the state's position by giving it a share in the upside. However, at the levels of superannuation we have modelled here, the amount of tax payable would be low.

We could also consider the results from a more sophisticated economic model.

Another point to consider is that we have effectively cut off volatility at age 65, by assuming the purchase of a lifetime annuity. It would be interesting to see the effect if we assumed instead that the member took an allocated pension.

References

[1] ‘*Superannuation: Do-it-Yourself?*’ APRA Insight 1st Quarter 2004, Australian Prudential Regulation Authority, available from www.apra.gov.au

[2] Coleman, A D. F., Esho, N., and Wong, M. (2003) ‘*The Investment Performance of Australian Superannuation Funds*’, Australian Prudential Regulation Authority, Working Paper 2003-01

Appendix

Table A: Splitting Fund: Starting Salary = \$50,000

| Case | Mean Annual return | St Dev Of Annual return | Average income from super Fund (as % of final salary) | Ninety percentile range of income from super Fund | Ninety percentile range of total income (super + age pension) | % of cases where member will receive | | | | Average age pension as % of maximum age pension |
|--------------------|--------------------|-------------------------|---|---|---|--------------------------------------|------------------------|----------------------------|------------------|---|
| | | | | | | No Age pension | Up to half age pension | More than half age pension | Full age pension | |
| Base | 6.5 | 7 | 24% | 16% to 36% | 37% to 49% | 0 | 3 | 97 | 0 | 71% |
| Defensive | 5 | 1 | 18% | 17% to 19% | 38% to 39% | 0 | 0 | 100 | 0 | 81% |
| Diversified Growth | 8 | 13.8 | 33% | 13% to 67% | 35% to 68% | 4 | 24 | 71 | 0 | 60% |

Table B: Splitting Fund: Starting Salary = \$100,000

| Case | Mean Annual return | St Dev Of Annual return | Average income from super Fund (as % of final salary) | Ninety percentile range of income from super Fund | Ninety percentile range of total income (super + age pension) | % of cases where member will receive | | | | Average age pension as % of maximum age pension |
|--------------------|--------------------|-------------------------|---|---|---|--------------------------------------|------------------------|----------------------------|------------------|---|
| | | | | | | No Age pension | Up to half age pension | More than half age pension | Full age pension | |
| Base | 6.5 | 7 | 24% | 16% to 36% | 23% to 36% | 6 | 74 | 19 | 0 | 34% |
| Defensive | 5 | 1 | 18% | 17% to 19% | 24% to 25% | 0 | 23 | 77 | 0 | 51% |
| Diversified Growth | 8 | 13.8 | 33% | 13% to 66% | 22% to 66% | 35 | 45 | 20 | 0 | 25% |

Table C: Choosing less diversified growth portfolio: Starting Salary = \$50,000

| Case | Mean Annual return | St Dev Of Annual return | Average income from super Fund (as % of final salary) | Ninety percentile range of income from super Fund | Ninety percentile range of total income (super + age pension) | % of cases where member will receive | | | | Average age pension as % of maximum age pension |
|---------------------------|--------------------|-------------------------|---|---|---|--------------------------------------|------------------------|----------------------------|------------------|---|
| | | | | | | No Age pension | Up to half age pension | More than half age pension | Full age pension | |
| Diversified Growth | 8 | 13.8 | 33% | 13% to 67% | 35% to 68% | 4 | 24 | 71 | 0 | 60% |
| Undiversified Growth | 8 | 20 | 33% | 9% to 84% | 33% to 84% | 8 | 19 | 71 | 2 | 63% |
| Poor performing high risk | 5 | 20 | 18% | 5% to 44% | 30% to 54% | 2 | 6 | 83 | 9 | 81% |

Table D: Choosing less diversified growth portfolio: Starting Salary = \$100,000

| Case | Mean Annual return | St Dev Of Annual return | Average income from super Fund (as % of final salary) | Ninety percentile range of income from super Fund | Ninety percentile range of total income (super + age pension) | % of cases where member will receive | | | | Average age pension as % of maximum age pension |
|---------------------------|--------------------|-------------------------|---|---|---|--------------------------------------|------------------------|----------------------------|------------------|---|
| | | | | | | No Age pension | Up to half age pension | More than half age pension | Full age pension | |
| Diversified Growth | 8 | 13.8 | 33% | 13% to 66% | 22% to 66% | 35 | 45 | 20 | 0 | 25% |
| Undiversified Growth | 8 | 20 | 33% | 8% to 84% | 19% to 84% | 32 | 33 | 35 | 0 | 35% |
| Poor performing high risk | 5 | 20 | 18% | 5% to 45% | 17% to 45% | 10 | 23 | 66 | <1 | 57% |