Proposed Default Approach to Auto-Enrolment
Colm Fagan Final 4 November 2018

Executive Summary
This paper sets out a default approach to auto-enrolment that delivers high returns for contributors at low risk and with low charges. It is straightforward to administer and easy for contributors to understand. The proposed approach ensures a frictionless and costless transition from pre-retirement to post-retirement. It also allows retired contributors to secure an income guaranteed to be payable for life, that doesn't involve them having to buy an annuity with the associated requirement to cede ownership of their pension assets to an insurance company. On death before or after retirement, the full account value (less amounts withdrawn to date for retired contributors) is paid to the contributor's dependents or estate.

For a worker joining at age 23, contributing a constant 4.5% of earnings, plus 4.5% from the employer and a further 1.5% from the state, making a total contribution of 10.5% of earnings, the expected pension from age 68 (the projected state pension age for someone now aged 23) is approximately 62% of earnings. This compares with an estimated pension of 39% of earnings under a scheme modelled on the UK's NEST (National Employment Savings Trust) default scheme and represents an uplift of close to 60%. Appendix 1 sets out the assumptions underlying these projections, together with a brief description of the NEST scheme.

The higher expected pension under the proposed approach comes primarily from investing contributors' funds in growth assets before and after retirement, rather than transferring them to low-risk, low-return assets in the run-up to retirement, and leaving them in low-yielding assets throughout their retirement, as happens under so-called "lifestyle" default investment options. Just under a quarter of the uplift comes from higher investment returns pre-retirement and slightly under three quarters from higher returns post-retirement.

While growth assets deliver significantly higher long-term returns than low-risk assets, they are risky in the short-term. The proposed approach uses smoothing to eliminate the short-term risks, while holding on to the expected higher long-term returns.

In retirement, contributors will draw from their pension accounts until age 75. At 75, they can buy protection against the risk of outliving their assets, while retaining full ownership of their accounts.

It is envisaged that the default auto-enrolment scheme will be administered exclusively by the proposed Central Processing Authority (CPA). Investment management and some aspects of account administration will be outsourced. The total costs of running the scheme, including investment management and account administration, will be adequately covered by a management charge of 0.5% per annum of assets under management. The scheme is expected to be self-financing within five years. There will be no need for long-term financial support or guarantees from the state.

The submission does not consider governance aspects. From a governance point of view, and looking at the Australian experience, the fiduciary responsibilities of trusteeship provide an additional layer of protection that does not exist in a purely contract based environment. For that reason, there is considerable merit in incorporating a trustee role into the CPA, to oversee the appointment of and to monitor the ongoing performance of investment managers, administrators and other service providers.

Details of proposed approach

1. Contributors' pension accounts will operate like individual savings accounts, within a trust-based governance structure. Money will be deposited to the account while the contributor is working; regular withdrawals commence from retirement date. The regular withdrawals in retirement can be considered as akin to pension payments.

2. Everyone will be credited with the same interest rate, irrespective of the amount being contributed, the size of the account, the contributor's age, and whether they are working or retired. The working assumption is that interest will be credited monthly, but it may be decided for practical reasons to credit it quarterly, especially as the rate is unlikely to vary significantly from one month/quarter to the next for the reasons explained below.

3. Contributions will be invested in growth assets such as equities and property, which are expected to generate significantly higher returns in the long-term than bonds and cash. Expert consensus is that the expected additional long-term return from growth assets over bonds is between 3% and 6% per annum.

4. The bulk of the money won't be claimed for decades, so returns will be smoothed over several years. Interest rates credited to contributors' accounts will be calculated by reference to smoothed returns. Appendix 2 sets out the proposed smoothing formula and how the smoothed return will be calculated. The sample calculation in Appendix 2 illustrates an important aspect of the proposed approach: even if markets fall at the start of auto-enrolment, smoothed returns will still be positive. In the example of Appendix 2, market values are assumed to fall by 2% each month for the first five months, then to rise by 4% in month 6. Despite the falls in the early months, smoothed returns are positive each month, falling gradually through months 1 to 5, from +0.380% (4.6% annualised) in month 1 to +0.319% (3.8% annualised) in month 5, then rising to +0.391% (4.7% annualised) in month 6.

5. Back-testing shows the proposed approach delivering positive smoothed returns in the longer term, even in difficult market conditions: For example, suppose auto-enrolment started on 1 November 2007, just before the stock market collapse of 2008/09. The S&P 500 Index fell 51% in the 16 months to March 2009. It then recovered and was back to its starting level by April 2012. A contributor who joined at the start would have seen the (unsmoothed) market value of their account down 35% by March 2009 but it would be back to break-even by December 2009. (The smaller loss - 35% versus 51% at March 2009 - and the earlier break-even point – December 2009 versus April 2012 - for regular contributions versus a lump sum invested at the start is because contributions invested at the bottom would have shown strong growth). In contrast, the smoothed account value, calculated in accordance with the formula of Appendix 2, would exceed contributions paid even at the bottom of the market in March 2009.

6. Figure 1 below compares market values and smoothed values with total contributions paid for someone starting in November 2007. The steady progression of smoothed values contrasts sharply with the wide variations in market values, which fluctuate between less than 70% and more than 130% of contributions paid within the first five years.

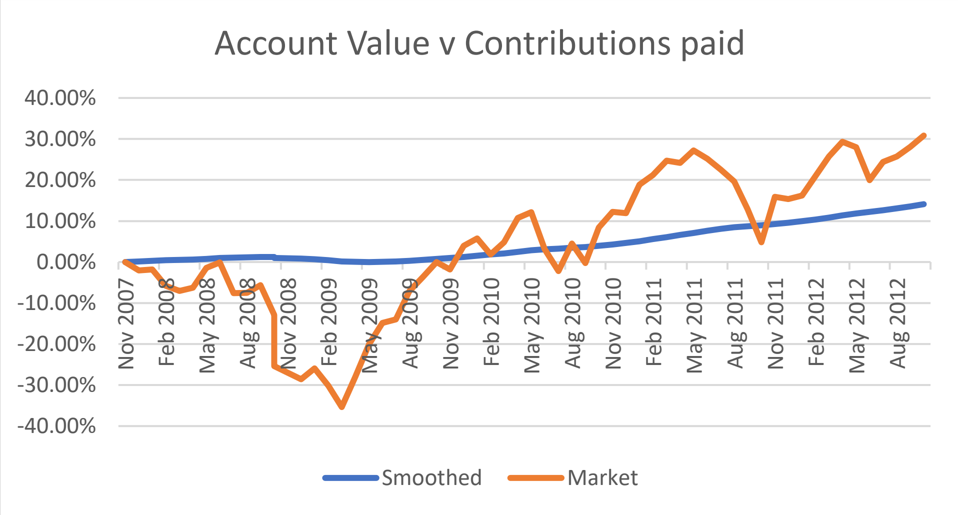

Figure 1

7. Over a longer period again, figure 2 below compares smoothed returns (red line) with market returns (blue line) for the 32 years from 1986 to 2017 inclusive, assuming a single investment at the start. The average growth rate for both smoothed and unsmoothed values over the entire 32-year period was more than 9% a year, but it is clear from the graph that the paths taken en route towards the similar long-term average were very different.

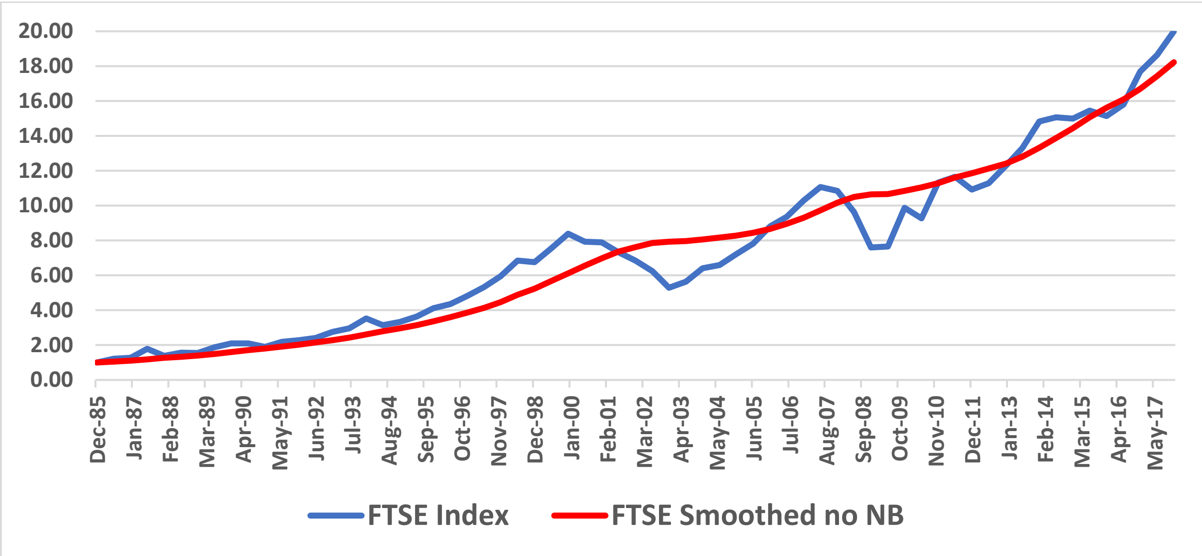

Figure 2

8. Figures 3A and 3B below show the frequencies of different percentage changes in monthly smoothed and unsmoothed returns over the 32-year period. The volatility of monthly changes in (unsmoothed) market values contrasts with the stability of corresponding changes in smoothed values. Figure 3A shows that market values fell more frequently than one month in every three; on twelve occasions they fell by more than 8% in a month, the worst being a fall of 26.5% in October 1987. In contrast, the worst smoothed result was a fall of just 0.1% in a month. Smoothed values rose in 382 out of 384 months. 1986 is the earliest year for which monthly figures were available. Approximate calculations for earlier years (based on yearly changes in market values and adjusting the smoothing formula for yearly rather than monthly data) indicate that smoothed returns would have been positive in every year bar one since 1900, a period that covered two world wars and the great

depression of the 1930's. In 1974, the sole exception to the record of positive returns, the yearly smoothed return would have been only marginally negative.

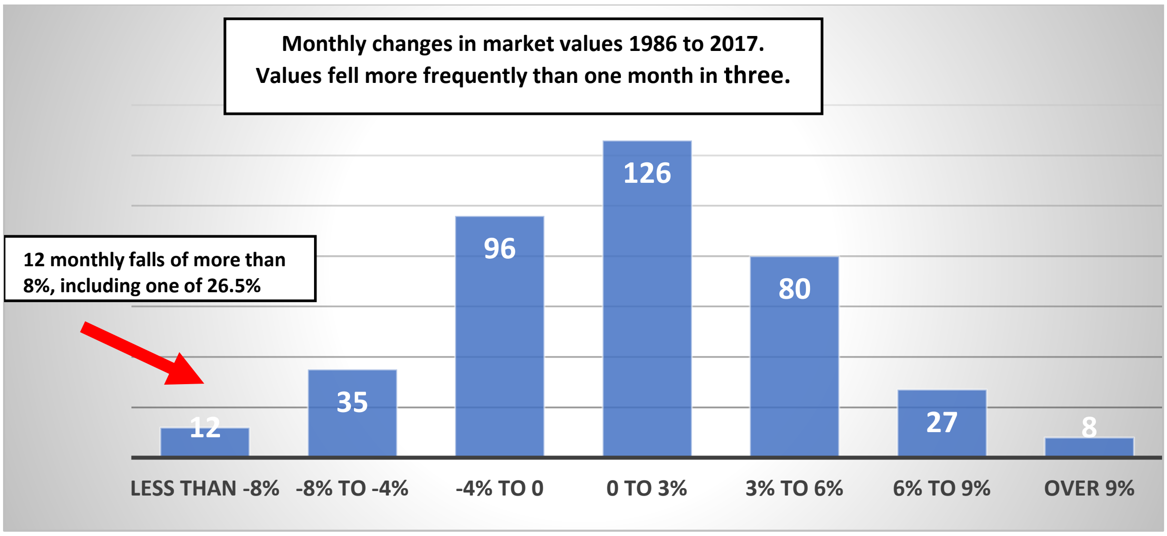

Figure 3A: Frequencies of different percentage changes in market values

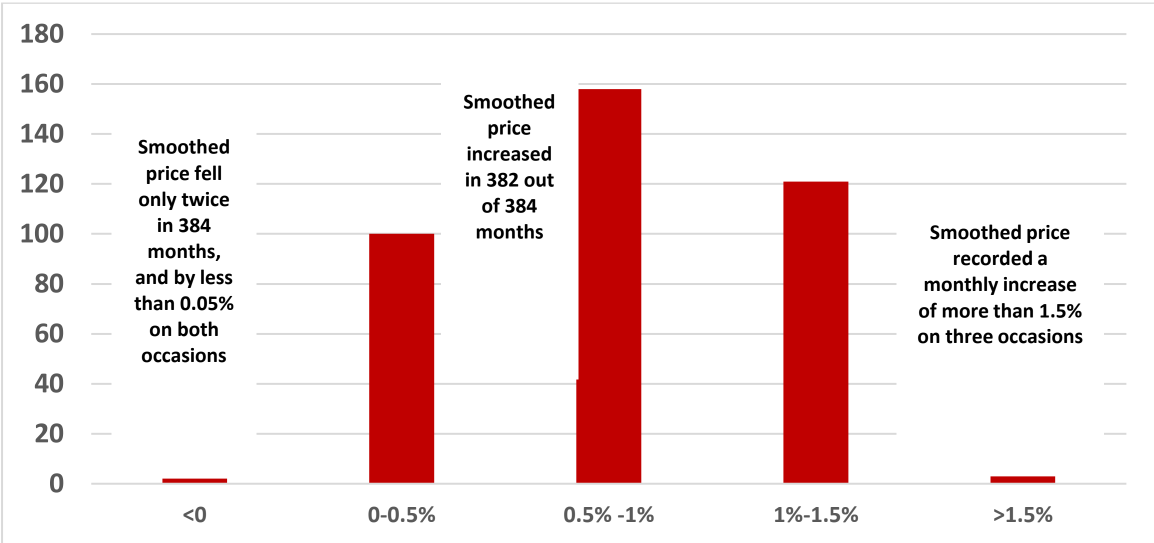

Figure 3B: Frequencies of different percentage changes in smoothed values

9. Similar contrasts between smoothed and unsmoothed returns can be expected in future. The average for both will be less than the 9% per annum achieved over the 32 years to end 2017, if inflation and interest rates remain at their current low levels. Assuming an average long bond yield of 2% per annum and an average Equity Risk Premium of 3.5% per annum, the expected return in future is 5.5% per annum (5.0% after charges). Smoothed returns in individual years are expected to range between 0% and 9%, falling towards the lower end of the range if the underlying assets perform poorly over a prolonged period and rising towards the upper end of the range on sustained good performance of the underlying assets. The possibility of negative smoothed returns over a twelve-month period cannot be ruled out, but the risk is extremely remote, based on the back-testing results outlined above.

10. Smoothing works because funds are locked in until retirement or death. Contributors cannot withdraw money from their pension accounts at will. Thus, in the above

hypothetical example of auto-enrolment starting on 1 November 2007, where the market value of an initial contributor's account would have fallen to 65% of its published value on 1 March 2009, available funds at that date would not have been sufficient to pay book values to everyone, but paying book value to the small proportion entitled to make withdrawals (either on death or retirement) when values were depressed would have had only a small impact on the fund's financial strength.

11. Market values are only relevant if assets must be sold. In the above example, if (say) 5% of funds were withdrawn at book value each year, the fund's market value would still have exceeded book value by December 2009, the same break-even date as if there had been no withdrawals. The cost to continuing members of paying book value to the 5% who withdrew each year would have been less than 0.4% of the fund's market value by that date and would have had no observable impact on smoothed returns quoted to contributors.

12. The fund's balance sheet will always show assets and liabilities at market value, e.g. at 65% of book value for a balance sheet prepared at 1 March 2009 in the above example. Book value will simply be a memorandum item, to indicate the direction of smoothed returns in future. If smoothed values are greater than market values at a balance sheet date, future smoothed returns will lag market returns until the gap is bridged and conversely if smoothed values are lower than market values at a balance sheet date. In the long-term, smoothed values will be above market values close to 50% of the time and below them close to 50% of the time. In the above hypothetical example of a balance sheet prepared at 1 March 2009, the 35% shortfall of market value from smoothed value would have been fully recovered by December 2009.

13. The integrity of the smoothing approach will be ensured by having strict rules to prevent financially sophisticated contributors from playing the system by making unscheduled withdrawals when smoothed values are above market values or unscheduled deposits when they are below market values. The rules won't have to be onerous, given that the purpose of the scheme is to enable employees to build a nest-egg during their working years for spending in retirement. For example, they might stipulate that withdrawals will only be allowed on death, or to provide a gratuity on retirement and a regular income in retirement. Full or partial withdrawals could also be allowed in other circumstances such as ill-health retirement or purchase of a contributor's primary residence, provided that the circumstances in which such withdrawals can be made are clearly defined in advance and are not subject to manipulation by financially sophisticated contributors.

14. The amount to be taken as a tax-free lump sum on retirement can be set as a percentage (say 25%) of the account value, with the other 75% being drawn down gradually in retirement. (As an aside, the figures in Appendix 1 don't allow for contributors taking a portion of their entitlement in cash at retirement.) Withdrawals in retirement must follow a regular pattern: "It's a pension, not a piggy-bank" is the mantra. For example, minimum and maximum annual withdrawal rates might be specified, say 3% minimum, 10% maximum (with higher maxima for ages over 80). There will also be a requirement that the amount withdrawn at any regular withdrawal date cannot vary from the previous withdrawal by more than (say) 5%, to prevent sophisticated contributors from withdrawing more when markets are depressed and less when they are elevated. The government may also have an interest in specifying minimum withdrawal percentages, to ensure an adequate income tax take from retired contributors. The rules will also stipulate that only regular contributions will be allowed – no once-off lump sum investments– and that contributions are expressed as a percentage of earnings, with notice required for a change in the contribution rate.

15. Each month, the smoothed return credited to contributors' accounts will be calculated in accordance with the formula in Appendix 2. A program will calculate the smoothed return from the following inputs:
    i. the previous month's smoothed value. (The smoothed value at the start will be the contributions invested in month 1);
    ii. the current market value of the fund, net of accrued charges at the agreed rate of 0.5% per annum (0.042% per month). Current market value gets a weighting of just 1.5% in the calculation, so exact current market values aren't required for all assets. This makes it easier to hold some unquoted investments in the fund.
    iii. External cash flow in the month (i.e. contribution income less payments to beneficiaries);
    iv. The assumed long-term rate of return. In month 1, this will be one-twelfth of 5.0%, assuming a long bond yield of 2% at the start. Appendix 2 sets out how this figure was derived. The assumed long-term rate will vary up or down in subsequent months, depending on the relative progress of smoothed values and market values.

16. Using these inputs, and these inputs only, the program will calculate the return to be credited to contributors' accounts for the month. No "expert" input or judgement will be required – nor will it be allowed. The integrity of the smoothing formula and its independence from outside influence are essential. Maintaining the integrity of the smoothing formula also ensures that auto-enrolment will operate on a mutual basis, with no need for financial underwriting or support from the state or an external financial institution.

17. The example of Appendix 2 shows a smoothed return in month 1 of 0.380%. If the market had gone up 3% rather than down 2% in the month, the smoothed return would have been 0.455%, just 0.075% higher for a 5% difference in market performance. This shows the relative insensitivity of the smoothed return to short-term changes in market values – a very desirable attribute from the contributor's perspective.

18. Smoothing has psychological advantages. Behavioural psychologists say that the pain of a 10% loss wipes out the joy of a 20% gain. That is one of the reasons why high-risk investments deliver higher long-term returns than less risky investments: investors in risky assets must be compensated for the pain of the occasional loss. Smoothing removes the pain and the joy, while capturing the extra return.

19. Each month, incoming contributions (net of withdrawals by retired members and account refunds to the estates of deceased contributors) will be transferred to the chosen asset manager or managers. Each investment manager's mandate will be to deliver the expected long-term return of the long bond yield plus 3.5% per annum (before the 0.5% management charge) for the asset class(es) in their mandate, over an investment horizon of (say) ten years. One corollary is that bonds and cash will have no place in the portfolio (except for short-term liquidity or tactical reasons), as cash and bonds have no hope of delivering the target return in the long-term. The asset allocation process will have a strategic overlay to minimise the risk of excessive exposure to a specific geography, industry sector, technology, investment theme or economic outcome. The diversified nature of the underlying investment portfolio means that investment returns will not be highly correlated to the performance of the local economy, thereby reducing the risks of a repeat of 2008/09, when a high proportion of Irish household savings were in domestic property.

20. Because (i) there will be no need to cash investments for many years, and (ii) the low weighting given to current market value in the smoothing calculation, there will be fewer restrictions on the marketability or short-term volatility of chosen investments, in contrast with conventional unitised arrangements. The easing of the constraints on liquidity and ready marketability means that, in the longer term, the fund will be able to invest up to an estimated 20% in unquoted assets such as forestry, infrastructure and real estate. It will be able to capture the illiquidity premium in those assets and so achieve higher long-term returns than could be achieved by buying quoted investments only. Studies show that the illiquidity premium could be worth 3% in extra return each year on average. This extra return hasn't been factored into the projections.

21. In the early years, it is envisaged that the funds will be invested almost entirely in listed equities. Academic research indicates that passive funds will deliver the required returns at significantly lower cost than actively managed funds. They are also less politically fraught. The cost of passive funds is estimated at less than 10 basis points a year (0.1%). This is the assumed cost of asset management in the estimate of the total cost of running the scheme. Any higher cost for active management must be justified by a higher expected return.

22. The simplicity of the proposed approach contrasts with the complexity of conventional pension arrangements. The UK's NEST scheme has 56 separate funds for active contributors, each of which must be priced daily or weekly. Each NEST fund has its own investment strategy to reflect that fund's investment objectives. The NEST administration system must ensure that units in the correct funds are credited to the correct accounts; it must also allow for contributors moving between funds. There are no such complications with the proposed scheme. Also, unlike the auto-enrolment scheme for Ireland being proposed in this submission, NEST does not cater for retired contributors. On retirement, NEST contributors must leave the scheme, take their money and effect individual arrangements at significant extra cost. Finally, under this heading, the lower level of complexity in the proposed scheme reduces operational risk significantly.

23. The cost of running the scheme will reflect its simplicity. Relatively little effort will be required to credit monthly interest to contributors' accounts, especially since everyone will get the same rate, irrespective of account size and whether they are working or retired. Projections of administration costs and of aggregate account balances for five to seven years into the future will be required to estimate the point at which revenues from fund-based charges will exceed administration costs. Those forward estimates are not available at present, but general considerations indicate that, in the long-term, the total cost of running the scheme will be less than the estimated charge of 0.5% per annum, inclusive of asset management fees of 0.1% per annum. Admin costs will be higher in the early years, but growing economies of scale should result in any excess costs in the early years being recovered by year 7 at the latest.

24. Currently, DC retirees need high quality advice at retirement and at regular intervals thereafter on the choices available to them under various headings. This advice is expensive and contributes to low investment returns in retirement. The first choice is how much of the fund at retirement to take in cash and how much to apply to secure an ongoing income. The decision is almost invariably to take the maximum allowable tax-free lump sum. The remainder of the total sum becoming available at retirement must be applied to secure a continuing income. The choice is between an annuity and an Approved Retirement Fund (ARF). Each of these decisions leads to further choices: if the decision is to buy an annuity, which insurance company offers the best rates; should the retiree choose a single life or

joint life annuity, one that escalates or remains fixed, guaranteed to be paid for a minimum period irrespective of survival to the end of that period? If the contributor decides on an ARF, the questions include: which company has the lowest charges; which has the best investment record; which fund choices will achieve the best balance between risk and reward, having regard to the contributor's risk tolerance; what level of annual draw-down minimises the risk of outliving one's savings? Once the initial choice is made, ARF holders need ongoing advice - every three years or so - on whether to change provider, or change the investment strategy/ fund choice, or the chosen income level, having regard to fund performance in the intervening period, etc.

25. The proposed approach removes the need to make many of these choices, with a resultant cost saving. There will be no annuity option. There will be only one fund, so there will be no investment choice. The only remaining choice is the amount to withdraw each year in order to minimise the risk of outliving one's savings. General advice can be given on the level of regular withdrawal that can be maintained throughout life, but the value of such advice is limited by the impossibility of predicting an individual contributor's lifespan: they could live for thirty years or be dead in five.

26. The proposed scheme will include a provision to help retired contributors manage the risk of outliving their savings. Before age 75, they can decide how much to withdraw each year, within the minimum and maximum limits set out above (3% and 10%). At age 75, they can opt to join the "Lifetime Income Fund" (LIF), membership of which will entitle them to withdraw one-fifteenth of the amount that was in their pension account at age 75, each year from then until death (plus interest between age 75 and date of withdrawal). On death within the 15-year draw-down period (i.e. before age 90), any remaining balance in the account is paid to the contributor's estate. If the contributor survives to age 90, they will have completely exhausted their account, but one-fifteenth of the account balance at age 75 (plus interest accrued to date of payment) will continue to be paid each year. The cost of the "bonus" withdrawals from age 90 on will be funded by contributions paid to the LIF between ages 75 and 90. The required contribution for this benefit is estimated to equate to a reduction of 2.6% per annum in the interest rate credited to the account each year from age 75. The LIF concept is explained in detail in Appendix 3.

27. It is currently envisaged that contributors will be free to decide whether to opt out of the Lifetime Income Fund or to join it for a portion of or all their account balance at age 75. It could be argued however that membership of the LIF should be made compulsory for all who survive to age 75, as membership of the LIF eliminates the risk of contributors outliving their savings in extreme old age. From the perspective of the individual contributor, there is not much downside to joining the LIF, even if they are in very poor health at age 75 and have little chance of surviving to age 90. This is because, unlike an annuity, the full remaining account value is paid to the estate of a contributor who dies shortly after joining the LIF; the only cost is the lower interest rate for the period from age 75 to date of death.

Conclusion

The proposed approach achieves the desired goal of high pensions at low cost and low risk. The pension uplift compared with a more conventional strategy could be even greater than the 60% indicated in the submission, as the 60% estimate ignores the additional cost of advice at and after retirement under conventional pension arrangements. Those costs could equate to a yield reduction of a further 1% a year post- retirement. It also ignores the expected additional return from investing a portion of the funds in higher yielding illiquid investments.

The lower costs have wider policy implications. The contribution rates from employers, employees and state can be reduced by 25% from the proposed 6% (employer and employee) and 2% (state) in the Strawman proposals, to 4.5% from employer and employee, 1.5% from the state. These lower contribution levels are expected to deliver a pension of 62% of earnings from age 68 to a contributor joining at age 23, on the assumptions of Appendix 1.

The low weighting given to current market values in the smoothing calculation means that the investment manager(s) can focus exclusively on generating long-term value. This exclusively long-term focus will benefit the wider economy and the enterprises in which the fund invests. The ability to deliver smooth returns without having to use derivatives will also contribute to stability in financial markets.

The proposed approach has drawbacks. Contributors will lose the ability to choose their own investments. In practice, however, the vast majority of pension scheme members prefer to leave the choice to others. In the UK, 99% of NEST contributors invest in the default funds.

Employees will not be forced into the default fund. They can opt instead to take out a pension policy with a commercial provider and choose their own investments from the range of funds offered by that provider.

The key issue is whether the proposed approach will prove robust in difficult economic and financial circumstances. It is impossible to give a definitive assurance on this, but back-testing results over the last 118 years for the UK stock market, over the last 92 years for US stock market, indicate that the proposed approach would have withstood every economic and financial contingency impacting those markets in that period.

The proposed investment strategy is to avoid excessive exposure to a specific geography, industry sector, technology, investment theme or economic outcome. When the fund gets to a more mature stage, it will also have significant investments in illiquid assets such as forestry, real estate and infrastructure, all well diversified geographically. This additional layer of diversification will further strengthen the fund's ability to withstand downturns in specific market sectors. Approximate back-testing results against the returns from 1870 for a diversified portfolio, including real estate, as published in the paper "The Rate of Return on Everything 1970-2015"[1] support this conclusion.

[1] "The Rate of Return on Everything, 1870 -2015", Òscar Jordà, Katharina Knoll, Dmitry Kuvshinov, Moritz Schularick and Alam M. Taylor. National Bureau of Economic Research, Cambridge MA, December 2017

Appendix 1
Comparison of expected pension under the proposed approach with that expected under a scheme modelled on the UK's NEST (National Employment Savings Trust) scheme.

The calculations assume a contributor joining at age 23, paying 4.5% of earnings, with another 4.5% from the employer and 1.5% from the state, making a total contribution of 10.5% of earnings. The contributor is assumed to retire at age 68 and to start withdrawing from their account a constant percentage of earnings, increasing with inflation. The amount withdrawn each year is assumed to be such that the account is completely exhausted at age 90. The complications resulting from the fact that some contributors will die before age 90 and some will live beyond that age are ignored but are addressed in the body of the proposal.

Charges under the NEST scheme are 1.8% of contributions plus 0.3% per annum of funds under management. The assumed charge under the proposed scheme is 0.5% per annum of funds under management, no charge on contributions.

Under the NEST default scheme, contributions are invested in low-risk funds for the first five years; then mainly in growth assets until ten years before retirement. Funds are gradually transferred into low-risk assets over the ten years preceding retirement and are completely in cash by retirement. Contributors must leave the NEST scheme at retirement, but the implicit assumption is that they will reinvest in low-risk assets post-retirement, either by buying an annuity (which the insurance company normally backs by investing in bonds) or by drawing down from a low-risk unitised fund. (In Ireland, 40% of insurance company ARF's are completely in cash). The projections ignore the additional charges (initial and ongoing) under individual post-retirement contracts (annuities and ARF's). ARF charges typically equate to a yield reduction of 1.5% to 2% per annum.

Under the proposed approach, contributions will be invested in growth assets throughout, including in retirement.

The estimated pension from age 68 under the proposed approach is 62.0% of earnings, compared with an estimated 39.3% of earnings under a scheme modelled on NEST, an uplift of close to 60%. The higher pension under the proposed approach is almost entirely attributable to investing in growth assets throughout rather than de-risking on the approach to, and in, retirement. The difference in charges (0.5% under the proposed approach v 0.3% plus 1.8% of contributions under NEST) has little impact. The lower rate of investment return in the early years under the NEST scheme also has relatively little impact, due to the low value of assets under management in the early years.

The detailed assumptions underlying the above calculations are:

Inflation:
1.9% per annum throughout. Applies to both earnings and pension in payment.

Investment return (before charges)

(a) Under NEST approach
2.3% per annum for the first five years and from age 68 on.
5.3% per annum from year 6 until ten years before retirement, then falling by 0.3% a year.

(b) Under proposed smoothing approach
5.5% per annum throughout.

Assumed investment returns under the proposed approach are higher, because funds will be invested exclusively in higher growth assets for the entire duration of the contributor's membership, from joining to death. Even in NEST's growth phase, a portion of the funds are invested in low-risk, low-return assets; this explains the 0.2% assumed excess return under the proposed approach over the assumed NEST return during its "growth" phase (5.5% v 5.3%).

Accumulated funds (expected values, ignoring volatility) at selected durations for a contributor joining at age 23, on the above assumptions for contribution level (10.5% of earnings), pension from age 68 (39.3% of earnings increasing with inflation under the NEST approach; 62.0% of earnings increasing with inflation under the proposed approach), growth, inflation rates and charges, are as follows:

Year	Age at end of Year	Accumulated Fund at year end under NEST approach (as a proportion of earnings)	Accumulated fund at year end under proposed smoothed approach (as a proportion of earnings)
5	28	51.2%	56.1%
10	33	114.6%	121.3%
15	38	188.2%	197.0%
20	43	273.8%	285.0%
25	48	373.1%	387.2%
30	53	488.6%	505.9%
35	58	622.6%	643.8%
40	63	756.8%	804.0%
45	68	846.7%	990.1%
Pension commences at 68 (duration 45)		Pension 39.3% of earnings for 22 years from age 68 to age 90 Total pension receipts 865% of earnings	Pension 62.0% of earnings for 22 years, from age 68 to age 90 Total pension receipts 1364% of earnings
5	73	655.9%	818.7%
10	78	464.1%	619.5%
15	83	271.4%	388.1%
20	88	77.7%	119.3%
21	89	38.9%	60.6%
22	90	0	0

Appendix 2

Proposed formula to calculate the smoothed returns

The smoothed value of the fund at the start of a month equals:

(a) 98.5% of Smoothed Value at the start of the previous month, uplifted by one month's interest at the assumed long-term rate of return (calculated as below); plus

(b) 1.5% of this month's market value, net of the management charge for the month of 1/12th of 0.5%, excluding cash flow in the month; plus

(c) Cash flow in the month (contribution income less account withdrawals).

The smoothed value at the start of auto-enrolment will be the contributions invested at the start of month 1.

Calculation of assumed long-term return

In month 1 of auto-enrolment, the assumed long-term return in (a) of the above calculation is:

- The current yield on long bonds, plus 3% per annum (3.5% less management fee of 0.5%). (3.5% is the assumed additional return expected over bonds by investing in growth assets).

From month 2 onwards, the assumed long-term return in (a) of the above calculation lies between an upper bound and a lower bound, determined as follows:

- The **upper bound** is the current yield on long-bonds plus 5.5% per annum (net of mgt fee)
- The l**ower bound** is the current yield on long bonds plus 0.5% per annum (also net of fee)

If the current market value of the fund is **above** the smoothed value, the assumed long-term rate of return for that month equals:

i. The assumed long-term rate in the previous month; ***plus***
ii. 2% of the difference between the **upper bound** (as defined above) and the previous month's assumed long-term rate of return.

If the current market value of the fund is **below** the smoothed value, the assumed long-term rate of return for that month equals:

i. The assumed long-term rate in the previous month; ***minus***
ii. 2% of the difference between the previous month's assumed long-term rate of return and the **lower bound** (as defined above).

Below is an example to show how the smoothed return is calculated over a six-month period. The example assumes a yield on long bonds of 2% throughout. Thus, the assumed long-term rate of return is 5% (2% plus 3.5% less 0.5%) in month 1. In subsequent months, it moves between an **upper bound** of 7.5% (2% plus 5.5%) and a **lower bound** of 2.5% (2% plus 0.5%).

Assuming cash flows of 100 in month 1, increasing to 200 in month 2, 300 in month 3, etc. as the scheme is rolled out, and assuming also that asset market values fall by 2% each month in months 1 to 5 and then increase by 4% in month 6, the month-by-month calculation of market values and smoothed values is as follows:

(a) Calculation of market values for the above example

Month	Cash flow at start of month	Fund market value at start of month	**Change in market value in the month**	Fund market Value at end of Month
1	100	100	**-2%**	98
2	200	298	**-2%**	292.04
3	300	592.04	**-2%**	580.20
4	400	980.20	**-2%**	960.60
5	500	1460.60	**-2%**	1431.38
6	600	2031.38	**+4%**	2112.64

(b) Calculation of smoothed values (for the same cash flows and market movements):

Month	Assumed long-term rate of return (Note 1)	Smoothed value at start of month (Note 2)	Smoothed value at end of month (Note 2)	**Smoothed return for the month (Note 3)**	Market Value at end of month (as above)
1	0.4167%	100	100.38	**0.380%**	98
2	0.4125%	300.38	301.48	**0.365%**	292.04
3	0.4084%	601.48	603.58	**0.349%**	580.20
4	0.4044%	1003.58	1006.93	**0.334%**	960.60
5	0.4005%	1506.93	1511.74	**0.319%**	1431.38
6	0.3966%	2111.74	2120.00	**0.391%**	2112.64

Note 1

The assumed long-term rate of return at the start is 1/12th of 5% (0.4167%).
At the start of month 2 the assumed long-term rate of return is the previous month's rate (0.4167%) less 2% of the difference between it and the lower bound of 0.2083% (2.5% per annum),
i.e. .4167% less 2% of (.4167% - .2083%) = .4125%.
At the start of month 3, the assumed rate is: 0.4125% - 2% of (0.4125% - 0.2083%) = .4084%, etc.

Note 2

The smoothed value at the start is 100 (cash flow in month 1).
The smoothed value at the end of month 1 is 98.5% of (100*1.004167) + 1.5% of 98 = 100.38.
The smoothed value at the start of month 2 is the smoothed value at the end of month 1 (100.38) plus the cash flow in month 2 (200), equals 300.38.
Smoothed value at end of month 2 is 98.5% of (300.38*1.004125) +1.5% of 292.04 = 301.48.
Smoothed value at start of month 3 = 301.48+300 = 601.48.
Smoothed value at end month 3 = 98.5% of (601.48*1.004084) + 1.5% of 580.20 = 603.58, etc.
(The calculations assume that the monthly changes in market values are net of the management charge of 0.042% charged in the month.)

Note 3

The smoothed return in a month equals the percentage increase in the smoothed value in the month, e.g. in month 1, the increase in the smoothed value is 0.38 (100.38-100) so the smoothed return for the month is .38/100 = 0.38%.
The smoothed return in month 2 is (301.48-300.38)/300.38 = 0.365%, etc.

Appendix 3

Lifetime Income Fund Example

The example traces the experience of 1,000 contributors who join the Lifetime Income Fund (LIF) at age 75, of whom 590 are assumed to survive to age 90, 102 to age 100 and just 2 to age 106. Each has a starting account balance of 150, divided into 15 sub-accounts of 10 each.

A constant interest rate of 5.0% per annum (5.5% less 0.5% charge) is assumed throughout. Contributors are assumed to pay 2.6% to the LIF, so the net interest rate credited to each contributor is 2.4% per annum.

The table below follows the simulated experience of 1,000 contributors starting at age 75, until just two are still alive at age 106.

		Per contributor			*For all contributors*	
Year	Age at start of year	Amount withdrawn from account, or received from the LIF	Remaining account balance at year end	Number of surviving contributors at year end	Total contributions to (+) or payments from (-) Lifetime Income Fund	Lifetime Income Fund at year end
		Note 1	***Note 2***	***Note 3***	***Note 4***	***Note 5***
1	75	10.12	143.36	984	+3,783	3,877
2	76	10.36	136.31	967	+3,547	7,705
3	77	10.61	128.85	948	+3,301	11,472
…	…	…..	….	….	….	….
13	87	13.45	27.22	664	+594	43,545
14	88	13.77	13.94	627	+345	46,076
15	89	14.10	-	590	+110	48,493
16	90	14.44	-	553	-8,259	42,454
17	91	14.79	-	512	-7,874	36,508
18	92	15.14	-	466	-7,403	30,748
…	…	…	…	…	…	…
30	104	20.13	-	7	-198	241
31	105	20.61	-	3	-107	143
32	106	21.11	-	2	-56	94

Note 1: Amount withdrawn each year per contributor

One sub-account is withdrawn each year. The value of each sub-account is 10 at the start of year 1 and accrues interest at 2.4% per annum until date of withdrawal. The sub-account withdrawn in year 1 includes half a year's interest, the one withdrawn in year 2 includes 1.5 years' interest, etc. The final sub-account is withdrawn in year 15 and the amount withdrawn (14.10) includes 14.5 years' interest at 2.4% per annum. All sub-accounts are cashed by age 90. From then on, each year's payments come from the Lifetime Income Fund. The payment in year 32, if the contributor survives until then (age 106) is 21.11, more than double the starting value of each sub-account.

Note 2: Remaining account balance at year end per contributor
By the end of year 1, each surviving contributor has 14 sub-accounts left, each of which has accrued a year's interest at 2.4%, so the total remaining account balance for each surviving contributor at the end of year 1 is 14 * 10 * 1.024 = 143.36;
the total remaining account balance for each surviving contributor at the end of year 2 is
13 * 10 * 1.024^2 = 136.31; etc.
Only one sub-account remains at the end of year 14; its value is 10 * 1.024^14 = 13.94

Note 3: Number of surviving contributors at year end
This is an estimate of the number of survivors at the end of each year from the starting 1,000 who join the Lifetime Income at age 75. The estimate allows for future improvements in mortality. The table assumes that 590 of a starting cohort of 1,000 joining at age 75 will still be alive at age 90 and that 13 will reach age 104. Estimates of numbers surviving to various ages are speculative. Regular actuarial assessments will be required to check their reasonableness. If mortality rates are heavier than assumed in the table, then the contribution rate to the LIF can be reduced from the assumed 2.6% and conversely if mortality rates turn out to be lower than assumed in the table. The very long-term nature of the calculation means that there will be adequate opportunity to refine estimates and to revise the required contribution rate for the longevity benefit. The required rate will probably increase gradually (estimated at about 0.1% every 5 years from 2050 onwards) if mortality continues to improve in future.

Note 4: Total contributions to (+) or payments from (-) the Lifetime Income Fund
This column shows total contributions to the Lifetime Income Fund falling gradually, from 3,783 in year 1 to 110 in year 15 as accounts are drawn down and contributors die.
The total contribution of 3,783 in year 1 equals 2.6% multiplied by 992, multiplied by 146.67, where

> 2.6% is the contribution rate to the LIF;
> 992 is the average number of survivors in year 1;
> 146.67 is the average remaining account balance per contributor in year 1.

The contribution reduces each year, as there are fewer survivors and surviving contributors have smaller account balances.
The final contribution of 110 in year 15 equals 2.6% of 6.95 (average remaining account balance in year 15), multiplied by 608.5 (average number of survivors in year 15).

The pay-out of 8,259 from the LIF in year 16 represents the first payment of a sub-account after surviving contributors have exhausted their accounts. It is calculated as follows:
571.5 (average number of survivors in year 16), multiplied by 14.45 (average notional sub-account balance in year 16).

Note 5: Lifetime Income Fund (LIF) at year end
The Lifetime Income Fund at any year end equals the balance at the end of the previous year increased by 5.0% (the assumed return on the fund, net of asset management and administration fees), plus contributions or less payments from the Fund after age 90, as per the previous column, both of which are assumed to occur midway through the year.

The table shows the Lifetime Income Fund increasing to a maximum of 48,493 at the end of year 15, just before the 590 surviving contributors reach their 90th birthday, and falling thereafter, to 94 by the time the 2 surviving contributors reach their 107th birthday.