

**Actuarial Review of the  
Contributory Pension Fund of  
Bermuda as of August 1, 2017**

**Final Report**

**May 30, 2019**

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# Executive Summary

This is the actuarial review for the Bermuda Contributory Pension Fund (the “Fund”) as at 1 August 2017 (the “Review Date”). It presents the financial status of the Fund at the Review Date and provides projections of the Fund for the next 50 years to 2067. The last review was done as at 1 August 2014.

During the 3-year review period, 2014 to 2017, the Bermudian economy saw an improvement in economic activity since the last review in 2014 as real GDP performance improved from -0.4% in 2014 to 2.5% in 2017.

Inflation (annual average Consumer Price Index) declined from 2.0% in 2014 to 1.7% in 2017, reaching its lowest level at 1.6% in 2016.

## Highlights of the Fund

The financial performance of the Fund over the three years was below expectations due to lower than expected investment returns and contribution income. This was tempered by lower than expected administrative and investment expenses and benefit payments. Table 1 shows the comparison of the actual experience with the projected experience from the previous review.

Table 1 Actual vs. Projected Experience

	2015-2017 Projected (millions of \$'s)	2015-2017 Actual (millions of \$'s)	% Difference
<b>Contribution Income</b>	\$355.1	\$335.9	5.5% below projected
<b>Investment Income</b>	\$202.8	\$185.5	8.5% below projected
<b>Benefit Expenditure</b>	\$456.9	\$437.8	4.2% below projected
<b>Admin &amp; Inv. Expenditure</b>	\$27.7	\$19.6	29.2% below projected
<b>Year-end Net Assets</b>	\$2,044	\$1,865	8.8% below projected
<b>Net Assets-Expenditure Ratio (end of period)</b>	12.6	11.5	8.7% below projected

\*Restated in 2014 dollars

- The Fund earned a nominal rate of return net of investment expenses of 3.0% per annum and a real rate of 1.2% per annum over the three years since the last review (3.2% and 1.4% if investment expenses are excluded). This compares with the real rate of return assumption of 3.5% per annum.
- The net assets of the Fund grew 3.46% over the three years from \$1.80 billion to \$1.83 billion. This was 8.8% below the projected value from the previous review.

- Contribution income in 2016/2017 (\$121.7 million) was 13% higher than in 2013/2014 and benefit expenditure (\$155.8 million) increased 16% over the three years since the last review.
- Total expenses for the three years averaged 0.37% of the average Fund, down from 0.52% over the previous 3 years. Pure administrative expenses averaged 0.15% of the average Fund over the 3 years and were 0.14% of the average Fund at the Review Date. As a percentage of contribution income, total expenses have been relatively stable over the last 10 years at 7.0%.
- The Asset / Expenditure ratio is a static measure of the size of the Fund to annual expenditure or the number of years cover provided by the Fund based on the current annual expenditure. This ratio decreased over the three years from 12.6 years to 11.5 years. Compared with 14 other regional social security schemes in a 2013 study, Bermuda's ratio is better than 9 of these countries (average 7.5 years). By comparison, the ratio for the Canada Pension Plan in 2017 was 6.56 years.
- The majority of the Fund's assets were invested at the last review and this continues to be the case at the Review Date. 97.3% of the net assets are invested, with the major investments being equities, hedge funds, bonds and private equities to a lesser extent.
- Since the last review, the number of contributors remained relatively constant, from 34,806 in the year ending 31 July 2014 to 34,890 in the year ending 31 July 2017.
- Both the benefit and contribution rates increased during the inter-review period by 5% and 7.5% respectively effective August 2016.
- Based on the population projection figures, the old-age support ratio has declined since the last review. The ratio was 3.9 in 2014 and is 3.6 in 2017. The ratio is projected to decline to 1.6 over the next 50 years. The comparative ratio using the actual contributors and beneficiaries of the Fund declined from 3.0 in 2014 to 2.7 in 2017.

A summary of the performance indicators mentioned above is shown in Table 2 below.

Table 2 Fund Performance Indicators

	July 2008	July 2011	July 2014	July 2017
<b>Number of Beneficiaries in receipt of monthly benefits</b>	9,509	10,459	11,568	12,842
<b>Average monthly benefit</b>	\$851.37	\$932.56	\$931.56	\$990.71
<b>Number of contributors<sup>2</sup></b>	37,213	35,913	34,806	34,890
<b>Active Insured as a % of Working Age Population</b>	92%	87%	89%	89%
<b>Pensioner Support Ratio: Number of contributors / Number of Beneficiaries</b>	4.1	3.4	3.0	2.7
<b>Old-Age Support Ratio: Population</b>	4.7	4.4	3.9	3.6
<b>Average number of weekly contributions per month</b>	3.86	3.84	3.55	3.45
<b>Weekly Benefit Rate for Contributory Old Age Pension (OAP)</b>	\$209.17	\$226.22	\$226.22	\$237.53
<b>Weekly Contribution Rate</b>	\$28.48	\$30.40	\$32.07	\$34.47
<b>Annual Contribution Income (\$ million)</b>	\$111.90	\$117.30	\$107.4	\$121.7
<b>Annual Benefit Expenditure (\$ million)</b>	\$93.50	\$115.45	\$133.7	\$155.8
<b>Annual Administration &amp; Investment Expenses (\$ million)</b>	\$7.90	\$9.45	\$8.4	\$6.3
<b>Net Assets (Fund) \$ million</b>	\$1,297.5	\$1,533.0	\$1,802.3	\$1,864.6
<b>Average Nominal Rate of Return (last 3 yrs)</b>	8.0%	6.4%	7.2%	3.0%
<b>Average Real Rate of Return (last 3 yrs)</b>	3.6%	4.2%	5.0%	1.2%
<b>Annual Expenses as a % of Contributions</b>	7.2%	8.5%	7.8%	5.1%
<b>Annual Expenses as a % of Average Fund</b>	0.61%	0.66%	0.49%	0.33%
<b>Administrative Costs as a % of Average Fund</b>	0.3%*	0.3%	0.19%	0.13%
<b>Net Assets / (Benefits and Expenses)</b>	12.8	12.3	12.6	11.5
<b>Invested Assets / Net Assets</b>	97%	95%	97%	97%

\*Estimated assuming Total expenses of \$8m split as \$4m in investment fees and \$4m administrative expenses

### Main Findings & Projection Results

- The Fund is projected to increase gradually until 2023 then decline steadily until it is exhausted in 2047 under the best estimate scenario. This is 2 years earlier when compared to the previous review.

- The total outgo (includes Old Age Pension (OAP) benefits, other benefits, and administration and investment costs) are projected to exceed contribution income throughout the projection period. By the year 2067, contribution income would need to be about 1.30 times the current level in real terms in order to match the increased level of benefit outgo. This would require contributions to be increased by between 3.0% and 3.5% a year more than benefit increases over the next 50 years.
- If contributions were to increase by 2.5% more than benefits with future real returns of 4% a year and higher, the Fund is projected to run out by 2050. Under scenarios of lower real investment returns and lower contribution rate increases, the Fund is not sustainable in the long term.
- If the contributing population is increased by 10% from 2017 and sustained at these levels thereafter, this is expected to extend the life of the Fund until 2053. For a 10% decrease in the number of contributors, the Fund runs out in 2042.
- If there is an increase in the retirement age to 68 years over a 5 year period ending 2026, all else unchanged, the Fund would decline gradually, but would remain sustainable for the projection period.
- The Fund has been projected to be sustainable to the end of the projection period if the retirement age were to increase to age 68 over 5 years combined with a real rate of return of 4.00% and if contributions were to increase by 3.00% more than benefits.
- The total number of beneficiaries over age 65, taking into account the impact of Non-Bermudians, is expected to increase steadily, reaching a peak in about 26 years. Thereafter, a gradual decline in numbers is expected.
- The total number of working age persons (age 20 to 64) is projected to decline gradually resulting in a declining old-age support ratio (3.6 to 1.6 over 50 years).

## **Recommendation**

In light of the fact that the current benefit and contribution structure is made up of flat rate amounts and the Government's policy is to increase both rates relative to inflation, with contributions increasing faster than benefits, we recommend that the Government should set a target 'benefit/contribution ratio' as part of the policy. This would ensure that any increases to both amounts would not result in the contribution rate exceeding the benefit rate at any point. The current ratio is 3.5 (241.57/68.94). Under the best estimate assumption of contributions increasing at 2.5% more than benefits, we applied the increase up to the year 2034 at which point the ratio was 2.5 and applied a 1.75% increase thereafter.

The projected contribution rates should also be compared to projected national average wages to ensure that they are feasible and affordable.

## **Accrued Benefits**

The present value of benefits accrued up to 31 July 2017 is estimated to be \$2.6 billion. This is based on the contributions made to that date and assumes no further increases to the benefit rate. If future increases to the benefit rate are included and assuming no further contributions, the present value of

these benefits increases to \$4.1 billion at the same date. If expected future benefit accruals are included up to the respective retirement dates, assuming benefit increases at the rate of assumed inflation of 3% per annum, the present value of both accrued and future liabilities is estimated to be \$6.3 billion. The present value of future contributions in respect of the future benefit accruals, assuming increases in the contribution rate of 2.5% above inflation up to 2034 and 1.75% above inflation thereafter, is estimated to be \$2.4 billion. These future contributions together with current assets total \$4.2 billion.

These calculations are only in respect of existing beneficiaries and the working population age group as at the Review Date. No new entrants into the Fund are assumed. All dollar amounts are quoted in 2017 Bermudian dollars.

**Table 3          Funded ratios**

<b>\$'billions</b>	<b>Accrued Benefits (no increases)</b>	<b>Projected Accrued Benefits</b>	<b>Projected Future Benefits</b>
<b>Total Liabilities</b>	<b>2.6</b>	<b>4.1</b>	<b>6.3</b>
<b>Present Value of Future Contributions</b>	<b>-</b>	<b>-</b>	<b>2.4</b>
<b>Current Fund Value</b>	<b>1.9</b>	<b>1.9</b>	<b>1.9</b>
<b>Total Fund + Future Contributions</b>	<b>1.9</b>	<b>1.9</b>	<b>4.2</b>
<b>Ratio: (Fund+ Future Contributions Value) / Liabilities</b>	<b>72.1%</b>	<b>45.0%</b>	<b>67.2%</b>

The Fund is estimated to be 72.1% funded on an accrued basis (no benefit increases) and 45.0% if benefits are assumed to increase at 3% per annum. If benefits continue to accrue and contributions are made assuming increases to both, then the Fund is estimated to be 67.2% funded. Note that the Fund is not designed around a policy of full funding but one of sustainable funding, that is, contribution and investment income is sufficient to meet benefits and administrative expenditure on an ongoing annual basis.

The present value of future pension payments for the next 10 years for existing beneficiaries is estimated to be \$983 million.

The present value of gratuities expected to be paid over the next 10 years, assuming contribution rates increase at 2.5% a year in excess of benefit increases is estimated to be \$37 million.

# Chapter 1 Introduction

We have conducted an actuarial review of the Contributory Pension Fund (the “Fund”) as at 1 August 2017 as requested by the Bermuda Department of Social Insurance (the “Department”). An actuarial review is required every third year by Section 35 of the Contributory Pensions Act, 1970 (the “Act”). The last review was performed as of 1 August 2014 by Morneau Shepell Ltd and the results were presented in our report dated May 2016.

The Act came into effect on 24 December 1970 replacing a repealed Act dated 5 August 1968. Since the last review, there were no significant amendments to the Act aside from amendments to change benefit and contribution amounts.

Under the Act, two classes of benefits are payable:

*Contributory benefits:* old-age pension and gratuity, widow(er)’s allowance and gratuity, and disability pension

*Non-contributory benefits:* old-age pension, and disability pension

Entitlement to contributory benefits depends on the period for which contributions are paid and on the annual average number of contributions (subject to a minimum contributory period and a minimum annual average). Non-contributory pensions are payable to those ineligible for contributory benefits, subject to certain qualifying criteria. The normal pension age for payments is 65 for both men and women.

Flat-rate contributions are payable by employed persons over school-leaving age, which is defined in the Act as age 18 or later. An equal contribution is payable by the employer. Self-employed persons pay flat-rate contributions equal to the joint amount payable by an employee and employer.

Appendix A summarises the main provisions relating to benefits and contributions.

Benefit and contribution rates are reviewed annually, taking into account the annual increase in prices, as measured by the Consumer Price Index (CPI) in the calendar year prior and the inflation outlook for the near term. Increases to benefits and contributions come into effect from August each year. Since August 2006, the Government’s policy intent for the Fund has been to increase benefit rates broadly in line with prices and contribution rates at 1.75% a year more than benefits (prices). However, contribution rates were frozen from 2009 to 2011. Contribution rates were increased by 5.5% in August 2012 with no further increases until 2016 with a 7.5% increase. A policy decision was announced in 2010 to increase contributions by 2.5% a year more than benefits. Benefits were increased by 5% in August 2016 and 1.7% in August 2017. Table B1 of Appendix B summarises price inflation and benefit and contribution increases in the period since August 2006. Table B2 summarises the rates of benefits and contributions payable in the years commencing August 2008 to August 2018. This report takes account of the benefit and contribution rates that were in effect in August 2017.

All dollar amounts in this report are quoted in 2017 Bermudian dollars.



## **1.1 Purpose of the Report**

The report is prepared in compliance with Section 35(1) of the Act. The purpose is to examine the financial condition and long-term sustainability of the Fund and to investigate the potential financial implications of future contribution and benefit increases for the Fund.

## **1.2 Scope of the Report**

The main purpose of the review is to assess the implications for future contribution rates of maintaining benefits at their present levels in real terms. We understand that the Government intends to continue to increase benefit rates in the future broadly in line with increases in the Consumer Price Index, with contribution rates increasing at 2.5% a year more than benefits. This therefore constitutes the central long-term policy assumption for this review, with consideration for the impact of this policy on the relationship between the contribution rate and the benefit rate. This is further discussed in Section 3 of the report.

The review includes projections of contribution income and expenditure (on benefits, administration and investment), projections of the Fund balance (allowing for an assumed rate of investment return), and projections of the number of years' outgo secured by the Fund. A projection period of 50 years has been used for the review.

The review is based on a long-term population projection, which includes another important indicator of the likely longer-term development of the Fund, namely the projected ratio of the number of contributors to the number of pensioners. This ratio, known as the "Pensioner support ratio", reflects the maturity of the Fund and the impact of demographic changes.

It is important to recognise that the financial projections for future years are based on reasonable assumptions but they should not be taken as forecasts of the outcome. The projections should be updated at successive actuarial reviews in light of the latest information available. In order to indicate the sensitivity of the results to changes in the main assumptions, the review includes alternative projections. These consider the effects of:

- increasing contribution rates at a lower rate of 1.75% per annum more than benefits and at a higher rate of 3% per annum more than benefits;
- assuming a higher (4%) and lower (2%) real rate of investment return on the Fund's assets;
- increasing the number of contributors by 10% over the projection period;
- decreasing the number of contributors by 10% over the projection period; and
- increasing the retirement age to 67.

Finally, the report includes an assessment of the estimated value of accrued benefits as at the effective date of the review. This is included in Appendix I, together with an estimate of the corresponding funding level at the review date.

The effective date of the review is 1 August 2017. The financial projections are expressed in terms of the benefit and contribution rates applicable from August 2017.

### **1.3 Result of Previous Review**

The previous actuarial review was conducted as at 1 August 2014. The main financial projections were expressed in terms of the benefit and contribution rates in effect at August 2014. Benefits were assumed to increase in line with changes in the assumed Consumer Price Index (CPI) for future years.

The main results of the 2014 review indicated that, if contributions were to increase at a rate 2.5% more than the increase in benefits and the Fund were to earn a real return of 3.5% a year then the Fund was projected to increase gradually until 2021 then decline steadily until it is exhausted in 2049. Under variant scenarios of investment returns and contribution and benefit rates, the Fund is projected to be sustainable in the short to medium term. Longer-term Fund sustainability was exhibited under scenarios where contribution rate increases exceeded benefit rate increases by 3% per annum and real investment returns exceed 4% per annum, all other assumptions remaining unchanged.

Although the funding policy for the Fund is one of 'pay-as-you-go', which is typical of most social security schemes, we are also asked to provide an estimated funded position to determine what level of accrued benefits can be provided by the current fund, for the current population and beneficiaries. In the previous review this figure was 48.4% assuming benefits continue to increase in the future with CPI. If benefits were frozen at 2014 levels the Fund was estimated to cover 78% of the accrued benefits.

# Chapter 2 Data & Experience since Previous Review, August 1, 2017

## 2.1 Data

For the 2014 review data was provided in a seriatim (individual) form in Excel spreadsheets extracted from the Department's new administration system. For this review, we also received seriatim data extracted from the legacy system. For beneficiaries, data covering the period 1 August 2014 to 31 July 2017 was received. For contributors, a record of every contributor who is not yet in receipt of a benefit as of the review date was provided. We noted that contribution history for the three inter-valuation years were nil for several records. These records need to be updated.

We were also provided with an Excel file from the Department of Statistics showing 'Jobs by Age Group and Bermudian Status of Job Holder, 2017'.

We also availed ourselves with the '2016 Population and Housing Census Report' and 'Labour Force and Population' statistics up to 2017 from the Department of Statistics website.

The data was checked for reasonableness by comparing the expected contributions and benefits from the data provided with the contributions and benefits recorded in the unaudited accounts taking into account the deficiency in the Government employee records.

We were also provided with copies of unaudited accounts for the years ending July 31 2015 (with 2014 comparison), 2016 and 2017. The statements included 'Balance Sheet Previous Year Comparison' and 'Profit & Loss Previous Year Comparison'.

A copy of the NEPC's report on the invested assets as at June 30, 2017, titled 'The Bermuda Government, Executive Summary, Contributory Pension Fund' dated August 11, 2017 was also received.

## 2.2 Economic Experience

The Fund's two main sources of income, contributions and earnings on investments, are closely linked to economic performance and labour market changes. Benefits are also affected by economic changes as both benefit and contribution rates are adjusted on an ad hoc basis relative to annual inflation.

As shown in the charts in Figure 1.1, the Bermudian economy saw an improvement in economic activity since the last review in 2014 as real GDP performance improved from -0.4% in 2014 to 2.5% in 2017.

Inflation (annual average Consumer Price Index) declined from 2.0% in 2014 to 1.7% in 2017, reaching its lowest level at 1.6% in 2016.

Unemployment rates have declined from 9% in 2014 and remained reasonably steady around 7% from 2015 to 2017.

Figure 2.1 Key Economic Indicators, 2014 to 2017



## 2.3 Fund Experience

### 2.3.1 Contributions and Benefits

Table C1 of Appendix C summarises the numbers and amount of monthly benefits in payment as at August 1, 2017 and August 1, 2014 for comparison. Table C2 of Appendix C summarizes the average amount of benefits paid in 2017 and 2014.

The largest group of beneficiaries was receiving contributory old-age pensions. There were 9,651 such beneficiaries in August 2017, compared to 8,768 in August 2014, an increase of 10.1% over the period. The average amount of benefits paid increased from \$1,036.28 in 2014 to \$1,104.35 in 2017 due to the increases to benefits during the period.

The total number receiving non-contributory old-age pensions increased significantly over the period since the previous review (31%). A spouse's allowance was in payment to 1,152 widows and 99 widowers in August 2017, compared to 1,142 and 100 respectively in August 2014 (increase of 0.9% and decrease of 1%). The number receiving contributory disability benefits increased from 187 to 200, and for non-contributory disability benefits, the number also increased, from 293 to 330.

Figure 2.2 Number of beneficiaries

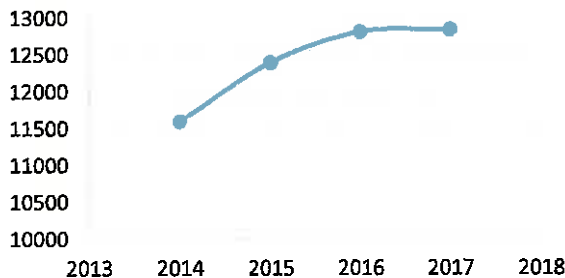
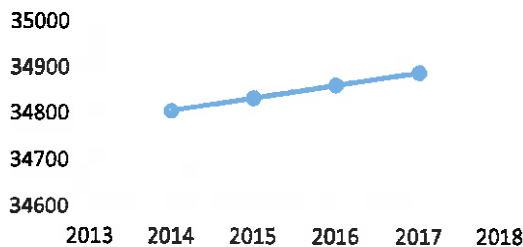


Table C3 of Appendix C summarises the number of persons making one or more contributions, and the average number of weekly contributions per month earned, for the 12-month periods ending 31 July 2015 to 2017. The actual number of persons making one or more contributions increased slightly over the 3 years since the previous review, going from 34,806 in the year ending July 2014 to 34,890 in the year ending July 2017. The average number of weekly contributions per month declined from 3.55 to 3.45 over the three years.

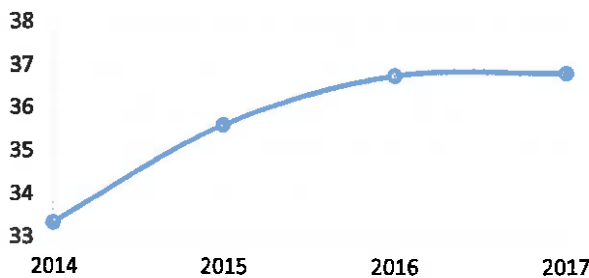
Table C4 presents an age distribution of the number of contributors for July 2015, 2016, 2017. The upward trend in contributors is consistent with the continued improvement in real GDP performance shown in Figure 2.1.

Figure 2.3 Number of Contributors



Social Security schemes are designed on the premise that the contributions from the working population together with investment income would be sufficient to pay benefits in any one year. The pensioner support ratio gives an indication of the number of persons in receipt of benefits relative to the number of contributors in the Fund. An increasing trend in this ratio indicates a higher likelihood that contributions would need to be increased above what is currently in place and a declining trend, the opposite. The experience of the Fund shows an increasing trend in this ratio. Figure 2.4 shows that the ratio of beneficiaries per 100 contributors has increased from 33 in 2014 to 37 in 2017.

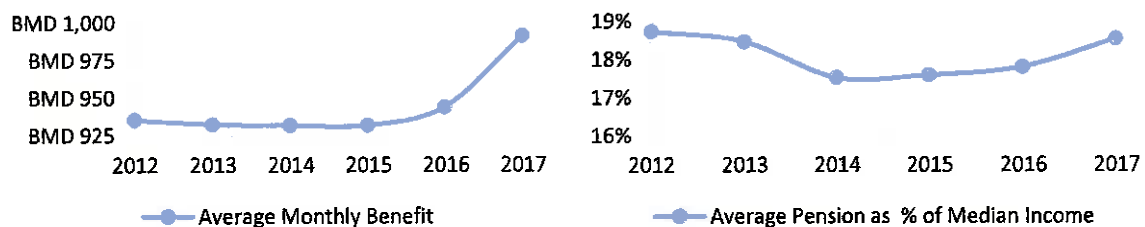
Figure 2.4 Beneficiaries per 100 Contributors



### 2.3.2 Replacement Ratio

Average pensions divided by average insurable earnings is often referred to as the replacement ratio. As there is no insurable wage defined under the Act, we have used the Median Gross Annual Income as per the *Bermuda Job Market Employment Briefs* prepared by the Department of Statistics, as a comparator. In 2012, the ratio was 18.7%. Thereafter the ratio declined until 2015 mainly due to level benefit amounts. In 2016 and 2017, the increase in benefit amounts is reflected in the increasing ratio. In 2017, the ratio is almost back to 2012 levels at 18.5%.

Figure 2.5 Average Pensions in Payment & Median Income, 2012 to 2017



### 2.3.3 Fund Income and Expenditure

The following table provides summary income and expenditure amounts for 2014 to 2017. A more detailed version of the Fund's finances for these years may be found in Appendix D.

Table 2.1 Summary of Fund's Income and Expenditure, 2014 – 2017 (millions of \$'s)

	2014	2015	2016	2017
<b>Income</b>				
Contributions	107.4	107.8	106.4	121.7
Investment (net)	220.7	41.1	23.7	152.9
Net Change in FV of Investments	(27.6)	(61.9)	(14.0)	26.5
Transfers / Other	0.7	6.4	1.7	9.0
<b>Total</b>	<b>301.2</b>	<b>93.3</b>	<b>118.0</b>	<b>310.1</b>
<b>Expenditure</b>				
Benefits	133.8	139.3	142.7	155.8
Administrative and Investment	8.4	6.2	7.3	6.3
Bad Debt Provision	0.4	0.2	0.5	0.6
<b>Total</b>	<b>142.6</b>	<b>145.6</b>	<b>150.4</b>	<b>162.7</b>
<b>Excess of Income over Expenditure</b>	<b>158.6</b>	<b>(52.4)</b>	<b>(32.5)</b>	<b>147.4</b>
<b>Net Assets (end of year)</b>	<b>1,802.3</b>	<b>1,749.6</b>	<b>1,717.2</b>	<b>1,864.6</b>

Figures may not sum due to rounding

Key highlights of income and expenditure are:

- (i) Contributions (on an accrual basis) were relatively stable over 2015 to 2016 but increased significantly in 2017. After no increase in contribution rates for five years, rates were increased effective August 2016 by 7.5%.
- (ii) Total investment income was volatile over the period. Investment income was negative in 2015, marginally positive in 2016 and significantly high in 2017.
- (iii) Total administrative costs declined marginally during the inter-valuation period. Included in these costs are Investment Managers' fees of \$3.7m, \$4.4m and \$3.8m for the three years 2015 to 2017, respectively.
- (iv) Benefit expenditure increased each year due to the increase in the number of beneficiaries and the increase in benefit rates.
- (v) In all three years, benefit expenditure exceeded contribution income. In addition, net income was negative in 2015 and 2016 and positive in 2017.
- (vi) Net Assets increased 3.5% over the three years.

## 2.4 Investments

As at 31 July 2017, the market value of the net assets was \$1.865 billion, approximately 12.0 times the benefit outgo in the year ending 31 July 2017. As at 31 July 2014, the corresponding figure was 13.5. If total outgo is considered, the coverage ratio in 2017 drops to 11.5. This means that the assets in the Fund at their current value can cover approximately 11 to 12 years of 2017 benefit payments. Table 2.2 shows the coverage ratios.

Table 2.2 Years of Benefit Coverage

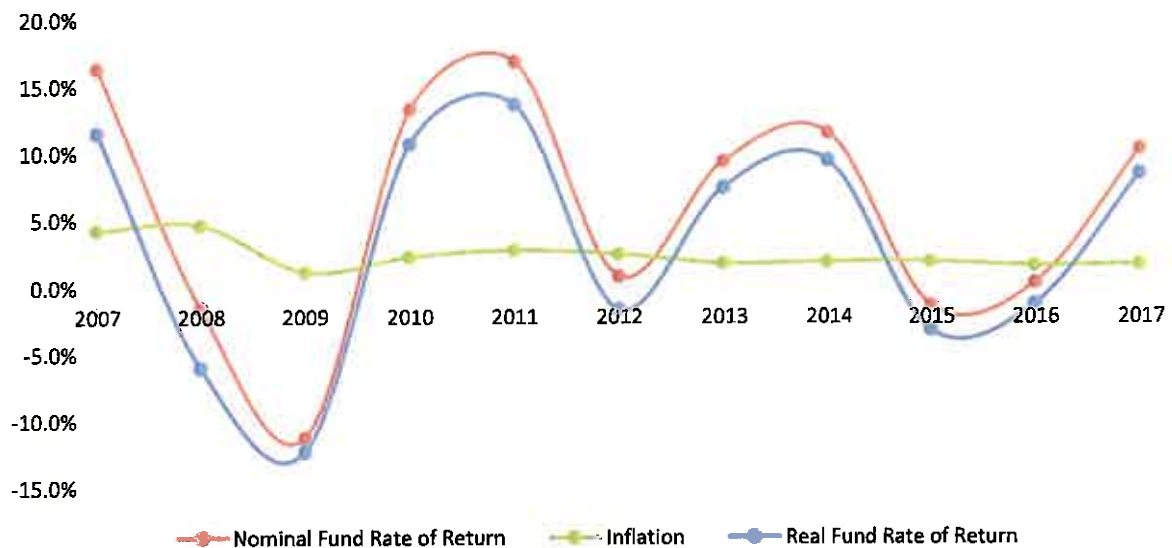
	2014	2015	2016	2017
Net Assets (end of year)	1,802.3	1,749.6	1,717.2	1,864.6
Benefits	133.8	139.3	142.7	155.8
Total Outgo	142.6	145.6	150.4	162.7
Net Assets / Benefits	13.5	12.6	12.0	12.0
Net Assets / Total Outgo	12.6	12.0	11.4	11.5

Over the three years ended 31 July 2017, the average nominal rate of return earned on the Fund was 3.0% per annum. Allowing for price inflation over the same period, the average real rate of return earned on the Fund over the three years ended 31 July 2017 was 1.2% per annum (see Table D3 of

Appendix D). Returns were low in 2015 and 2016 (real return -3.2% and -1.3%) but high in 2017 (real return 8.5%).

Over the ten years ended 31 July 2017, the average nominal rate of return earned on the Fund was 4.5% per annum. Allowing for price inflation over the same period, the average real rate of return earned on the Fund over the ten years ended 31 July 2017 was 2.2% per annum. This is below the long-term real rate of return of 3.5% assumed in this review.

Figure 2.6 Fund rate of return, 2007 to 2017



The relationship between investments and net assets, which measures how efficiently available funds are invested, averaged 98% over the 3-year review period. This ratio indicates that there is a very high level of efficiency in the investment of the funds. Table D2 provides a breakdown of the total assets in the Fund.

The Investments of the Fund are guided by a Statement of Investment Policy & Procedures (last updated in 2010) which sets out investment objectives and guidelines for the Fund and defines the management structure and monitoring procedures for both internal and external investment management. It also includes a desired asset allocation policy for the Fund. The following table shows the asset mix at June 2014 and 2017 compared with the target ranges. The invested asset allocation has been relatively stable with shifts among the asset categories still aligned with the target investment asset mix.



Figure 2.7 Invested Asset Allocation June 2014

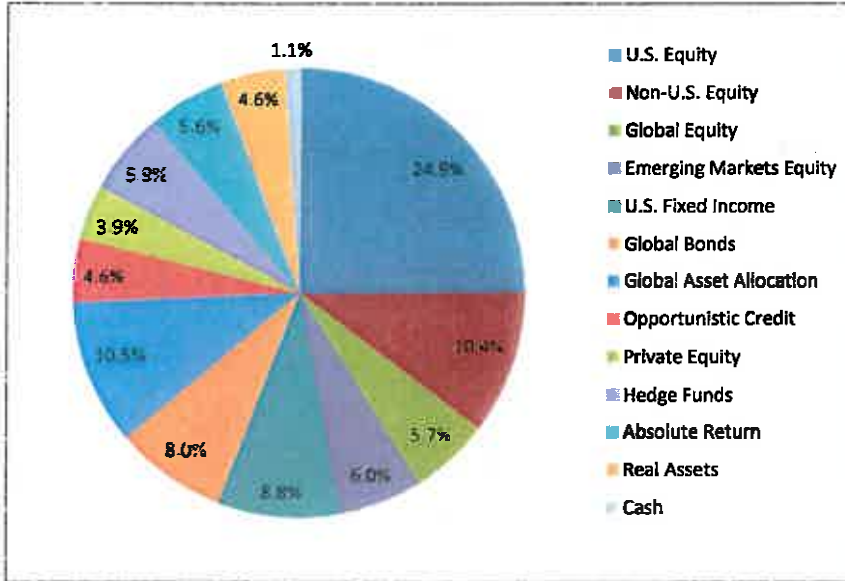
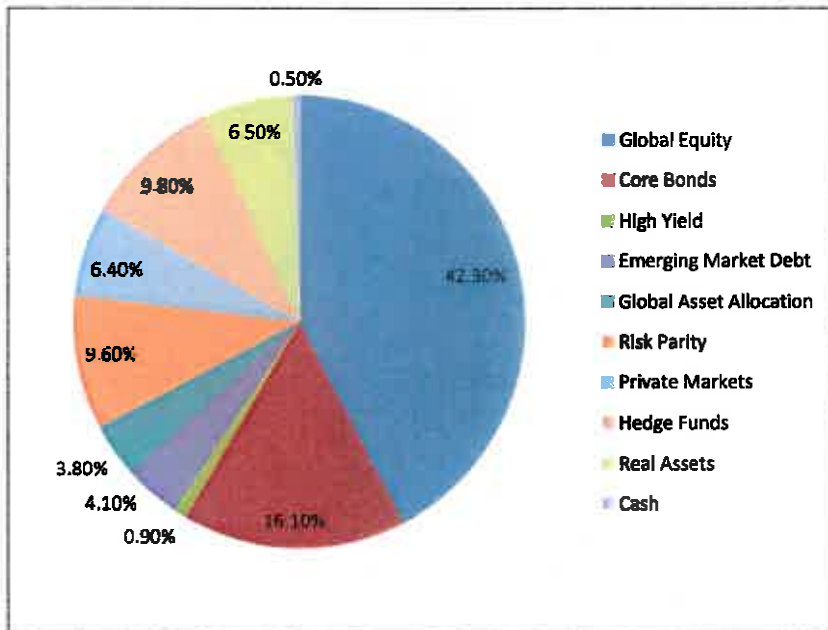


Figure 2.8 Invested Asset Allocation June 2017



**Table 2.3 Actual and Target Asset Allocation June 2014 and 2017**

<b>Invested Asset Category</b>	<b>2014</b>	<b>Target</b>
U.S. Equity	24.9%	24.0%
Non-U.S. Equity	10.4%	10.0%
Global Equity	5.7%	5.0%
Emerging Markets Equity	6.0%	6.0%
U.S. Fixed Income	8.8%	10.0%
Global Bonds	8.0%	9.0%
Global Asset Allocation	10.5%	10.0%
Opportunistic Credit	4.6%	5.0%
Private Equity	3.9%	5.0%
Hedge Funds	5.9%	6.0%
Absolute Return	5.6%	5.0%
Real Assets	4.6%	5.0%
Cash	1.1%	0.0%

*Source: Investment Performance Reports June 30*

<b>Invested Asset Category</b>	<b>2014</b>	<b>Target</b>
Global Equity	42.3%	38.0%
Core Bonds	16.1%	16.5%
High Yield	0.9%	1.0%
Emerging Market Debt	4.1%	5.0%
Global Asset Allocation	3.8%	3.0%
Risk Parity	9.6%	10.0%
Private Markets	6.4%	10.0%
Hedge Funds	9.8%	9.0%
Real Assets	6.5%	7.5%
Cash	0.5%	0.0%

## 2.5 Experience Compared With Projections from Previous Review

Shown below is a comparison of actual cumulative experience over the 3-year period with the projections of the main “best-estimate” scenario of the previous Actuarial Review.

Table 2.4 Projections from Previous Review Compared With Actual Experience

	2015-2017 Projected (millions of \$'s)*	2015-2017 Actual (millions of \$'s)	% Difference
<b>Contribution Income</b>	\$355.1	\$335.9	5.5% below projected
<b>Investment Income</b>	\$202.8	\$185.5	8.5% below projected
<b>Benefit Expenditure</b>	\$456.9	\$437.8	4.2% below projected
<b>Admin &amp; Inv. Expenditure</b>	\$27.7	\$19.6	29.2% below projected
<b>2017 Year-end Net Assets</b>	\$2,044	\$1,865	8.8% below projected
<b>Net Assets-Expenditure Ratio (end of period)</b>	12.6	11.5	8.7% below projected

\*Restated in 207 dollars

The results show that contribution income and benefit expenditure were lower than expected as both rates increased less than expected. Administrative and Investment expenditure was significantly lower than expected. Of the \$19.6 million, \$7.8 million is attributable to pure administrative cost over the three years. Investment income was lower than expected. The assumed real rate of return on the Fund assets was 3.5% for 2015 to 2017. The actual average real rate of return over the three years was 1.2%. Inflation was assumed to be 3%, while average inflation for the three years was 1.7%. The overall result is a lower than projected Fund value.

## 2.6 Subsequent Events

This report is being prepared in April 2019. Contribution and benefit rates have changed from 2017 and we have taken this into consideration when preparing the projections.

We understand that the Government is implementing a number of strategies to reduce the incidence of non-communicable chronic disease (‘NCD’), better manage existing NCDs, and restructure the health system financing to promote better continuity of care and more efficient use of resources. The ultimate goal is a healthier population, which, if attained, should see the mortality rates continue to improve.

In conducting this review, we have taken this increase in longevity into consideration in setting the mortality assumption.

## Chapter 3 Best-Estimate Assumptions

Many demographic and economic factors, such as changes in the size and age structure of the population, economic growth, employment and inflation, influence the Fund finances. Therefore, to best assess the Fund's long-term costs and sustainability, projections of Bermuda's total population and the economy are required. For this review 50-year projections have been performed.

In developing the assumptions used for the projections, historical trends and reasonable future expectations, as well as the interrelationships between the various assumptions, have been taken into account. Core projections have been performed using assumptions that reflect best estimates. The demographic and financial projection results based on this assumption set is referred to throughout this report as "*Best Estimate*."

Given the uncertainty inherent in forecasting long periods, projections using additional sets of assumptions that vary contribution income and outgo (benefits and expenses); and the progression of the Fund balance allowing for investment returns, hereinafter referred to as "*Variant*" have also been performed. These alternative projection sets encompass assumptions that are generally more optimistic and more pessimistic than best-estimate assumptions. Results of the Best Estimate, Variant and Alternative scenarios are presented in Chapters 5 and 6 respectively.

### 3.1 Demographic Assumptions

This section describes the estimating methods and demographic assumptions adopted for the review. We have used the same methodology that was used in the previous review, except where noted.

#### 3.1.1 Population projections

We produced a long-term population projection for the 50-year period covered by the review (2018 to 2068). The baseline population for the long-term projection is taken from the 2016 census, which showed total numbers of males and females split into five-year age groups. Appendix E contains a description of the assumptions adopted for the projection and the results.

Table 3.1 summarizes the results of the projection as well as the projected ratio of the number of working age to the number over pension age, commonly known as the "old-age support ratio".

Table 3.1 Projected Population 2017 - 2067 (Males and Females)

Males and Females						
As at 31 July	Births	Ages 0-19	Ages 20-64	Ages 65+	Total	Old-age support ratio
2017	559	12,623	40,099	11,080	63,801	3.6
2022	536	12,239	38,398	13,628	64,265	2.8
2027	505	11,755	35,993	16,678	64,425	2.2
2032	494	11,130	33,787	19,103	64,020	1.8
2037	488	10,672	31,920	20,480	63,072	1.6
2042	471	10,311	30,281	21,025	61,618	1.4
2047	452	10,023	28,703	20,925	59,651	1.4
2052	429	9,740	27,294	20,265	57,299	1.3
2057	411	9,387	26,572	18,807	54,766	1.4
2062	399	9,011	26,098	17,218	52,327	1.5
2067	388	8,668	25,296	16,186	50,149	1.6

The population over pension age is expected to rise steadily over the next 25 to 30 years, at which point it is projected to be almost double the current population over pension age. Thereafter the over pension age population is projected to stabilise, and then gradually decline.

The under age 65 population is expected to decline, gradually at first but more quickly towards the end of the projection period. This decline is due to a combination of the projected continuation of a low birth rate and little or no economic growth. The 2016 census report projected a population of 63,892 as at July 1, 2017.

The old-age support ratio is a particularly useful indicator of future trends, and Table 3.1 shows a steady fall in the ratio. As at August 2017, there were 3.6 people of working age per pensioner but over the next fifty years or so, this ratio is projected to fall to 1.6.

The above projections assume that there is no change to the current immigration policy.

### 3.1.2 Projected Contributors and Beneficiaries

The results of the 50-year population projection are used to project the numbers of contributors (and the number of weekly contributions) and beneficiaries. Appendix F describes the methods and assumptions adopted for this purpose. The assumptions generally reflect the recent experience but with some modifications for the longer-term. The following paragraphs summarise the projected numbers of contributors (and the number of weekly contributions) and beneficiaries. It should be noted that the projections are subject to increasing uncertainty in later years.

### 3.1.3 Projected Numbers of Contributors and Contributions

The projected numbers of weekly contributions are based on the projected numbers of contributors and the assumed average annual number of weekly contributions per contributor. The projected number of contributors is derived by applying age-specific factors to the projected population in 5-year age groups, with the factors representing the long-term assumed proportions of the population in each age group that will contribute to the Fund. It has been assumed that the proportion of contributors in each 5-year age group will be similar to that obtained from the data provided for the 12-month period ending 31 July 2017. Table 3.2 summarizes the projected number of contributors to the Fund.

Note that the number of contributors considers that persons from all three age groups contribute to the Fund as well as persons who are no longer in the population and have left Bermuda but who are still entitled to a future benefit. Table 3.2 indicates that the projected total number of contributors decreases gradually over the projection period to about 65% of the 2018 figure.

The projected number of weekly contributions paid in a year is based on the projected number of contributors multiplied by the average number of weekly contributions paid by each contributor. Depending on the beneficiary category, each contributor is assumed to contribute, on average, the number of weekly contribution that is consistent with the average benefit for that benefit category.

Table 3.2 Projected numbers of contributors

Year ending 31 July	Males	Females	Total
2018	17,998	16,998	34,996
2023	17,424	16,449	33,873
2028	16,534	15,615	32,148
2033	15,515	14,659	30,173
2038	14,730	13,923	28,654
2043	13,927	13,170	27,098
2048	13,251	12,536	25,787
2053	12,608	11,933	24,541
2058	12,223	11,573	23,796
2063	11,950	11,320	23,270
2068	11,618	11,010	22,628

### 3.1.4 Average Age of Contributors

Table 3.3 summarises the projected average age of future working age contributors to the Fund at five-year intervals over the projection period. The average age increases initially to year 2028 from 46.1 years to 46.6 years and then declines gradually thereafter to 45.1 years in 2068.

Table 3.3 Projected average age of future contributors

Year ending 31 July	Males	Females	Overall
2018	46.2	45.9	46.1
2023	46.8	46.4	46.6
2028	46.8	46.2	46.5
2033	46.4	45.7	46.0
2038	46.1	45.6	45.8
2043	45.5	45.4	45.4
2048	45.1	45.2	45.2
2053	44.8	44.7	44.8
2058	44.8	44.6	44.7
2063	45.1	44.8	45.0
2068	45.4	44.8	45.1

### 3.1.5 Benefits and Beneficiaries

The projected amounts of benefits are based on the projected number of beneficiaries (contributory and non-contributory) and the average benefit payable. The distribution of benefits among the population differs from the previous review as the seriatim data was used to inform the revised distribution. Appendix F gives details of the distribution of benefits among the population.

Table 3.4 summarises the projected total numbers of beneficiaries in receipt of contributory and non-contributory old age pension.

Table 3.4 Projected numbers of Beneficiaries (aged 65 or over)

Year ending 31 July	Males	Females	Total
2018	4,971	6,496	11,467
2023	6,236	7,963	14,198
2028	7,663	9,585	17,248
2033	8,776	10,610	19,386
2038	9,502	11,190	20,691
2043	9,756	11,294	21,049
2048	9,646	11,256	20,901
2053	9,182	10,811	19,993
2058	8,436	10,038	18,474
2063	7,727	9,241	16,968
2068	7,248	8,760	16,008

Table 3.4 indicates that the total number of beneficiaries (contributory and non-contributory) over age 65 is expected to increase steadily, reaching a peak in about 30 years. Thereafter, a gradual decline in numbers is expected.

The male to female ratio of over 65 beneficiaries is reflective of the ratio that exists at the Review Date. The impact of higher male mortality has also resulted in a higher number of females than males in this age grouping.

### 3.2 Financial Assumptions

The results are shown at constant 2017 price levels. The projections allow for the assumed increases in benefits and contributions, and are then deflated by the assumed rate of price increases. The review takes into account the actual benefit and contribution rates in effect from August 2017 and August 2018.

The main financial assumptions are the rates at which benefits and contributions will increase (relative to prices) from August 2018, the real rate of investment return (in excess of price increases) and rate of increase of the administrative and investment expenses. It is not necessary to make an explicit assumption in respect of future price increases because the assumed increases to both benefit and contribution rates are expressed relative to price increases.



### **3.2.1 Increases to Benefit and Contribution Rates**

It has been assumed that, over the long-term, benefits will increase in line with prices. Contributions have been projected on three assumed rates of increase, as follows:

- (a) a rate of 1.75% a year more than benefits (i.e. price increases plus 1.75%);
- (b) a rate of 2.5% a year more than benefits (i.e. price increases plus 2.5%); and
- (c) a rate of 3% a year more than benefits (i.e. price increases plus 3%).

For this review, contributions are assumed to increase at the above rates until the year 2030 and thereafter the increase is assumed to be 1.75% more than price increases. This approach is taken so that the projected contribution rate does not surpass the benefit rate and that the ratio of the benefit rate to the contribution rate is approximately 2.5 times under the base scenario (b) above. The ratio of benefit rate to contribution rate is 3.5 (2017) and 3.4 (2018). When benchmarked against Canada and their current ratio of maximum benefit to contribution rate is approximately 2.3 in 2017. For other Caribbean countries, except Trinidad and Tobago, this ratio is significantly lower than 2.5.

### **3.2.2 Real Rate of Investment Return**

The investment of the assets is overseen by the Bermuda Public Funds Investment Committee ('PFIC'). The assets in the CPF are pooled with Bermuda's largest public sector pension fund for investment purposes. The investment is guided by an investment policy and the investments are undertaken by a number of investment managers. As part of the actuarial review, the PFIC provides the actuaries with a 30-year projection of returns for each asset class, which is prepared by the firm NEPC, LLC, an investment consulting firm. Based on the target asset mix of the CPF, an expected long-term rate is developed. As the projections are for more than 30 years one would expect that the further into the future the projection, the less certainty is given to the future rate, so we expect the rate to be less than that used for a 30-year projection.

Using the NEPC's '2018 Investment Outlook', the geometric expected returns and the target investment mix, the projected rate of return on the Fund is 7.4% over the next 30 years. The NEPC projects a 5-7 year inflation of 2.5% and 2.75% for their 30 year projections. We have therefore maintained the best estimate assumption of 3% CPI and 3.5% real rate of return for this review. We think this is prudent given that the projections are for 50 years, which brings an inherent uncertainty in predicting assumptions for such a long period. We note that the real rate of return over the last 10 years was 2.2%.

Alternative projections of the Fund balance have been carried out using assumed real rates of return of 2% a year and 4% a year. This seems a reasonable range for the real rate of return in view of the returns achieved over the past decade.

### **3.2.3 Administration and Investment Expenses**

For the purposes of the review, we have assumed that administration and investment expenses will increase at a rate of 1.5% a year in excess of price increases. Total expenses for the year ending 31 July 2017 amounted to \$6.2 million. Pure Administrative expenses totalled \$2.5 million as stated in the financial statements. The remaining expenses relate to investment management charges and custodial fees. It is also expected that Administration expenses may decline in the future after the

implementation of a new administration system but no credit has been taken for this in the projections. Appendix F includes a further explanation of the assumed level of administration and investment expenses.

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## Chapter 4 Best-Estimate Projections

The Fund is projected to increase gradually until 2022, and then decline until it is depleted in 2047 under the best estimate assumptions. That is, contributions increase 2.5% more than benefits until 2034 and by 1.75% more than benefits, thereafter and contributor levels remain at the 2017 levels as a percentage of the working age population. Investment returns of 3.5% per annum in excess of inflation are also assumed. In the previous review, the Fund was expected to be exhausted in 2049. There are several contributing factors which, when combined, have produced these results. These factors are as follows:

- The investment performance of the Fund was on average below expectations over the three years 2015 to 2017. The net real return of the Fund over the 3-year period up to the Review Date was 1.2% per annum compared to the projected 3.5%.
- Although both benefits and contributions were increased over the three years, contributions did not increase by 2.5% more than benefits.
- These losses were tempered by lower expenses and increased number of contributors.

A summary of the impact of the above changes on the life of the Fund is shown below.

**Table 4.1 Impact of Changes in Assumptions and Modelling**

Changes in Assumptions and Modelling	Year Fund is Expected to be Exhausted	Change in Year Fund is Expected to be Exhausted
Existing model as at the last actuarial review	2049	-
Using actual Assets (Fund experience)	2047	(2)
Changes in base scenario	2046	(1)
Update with new demographic data	2048	2
Using actual fund expenses	2049	1
Using actual 2017 and 2018 contribution and benefit rates	2047	(2)

The results of the financial projections over the 50-year period to the year ended 31 July 2067 are expressed in terms of the benefit and contribution rates effective from August 2017.

The results show projections of:

- (i) contribution income and outgo (benefits and expenses); and
- (ii) the progression of the Fund balance allowing for investment returns.

#### 4.1 Projected Income and Outgo

Table 4.2 summarises, at five-yearly intervals, the projected contribution income, increasing in line with prices plus 2.5% a year starting effective August 2018 until 2034 and prices plus 1.75% thereafter, and the projected total outgo of the Fund, at 2017 prices. Table G1 of Appendix G shows results for each year of the projection period.

Table 4.2 Projected income and outgo (\$million) at constant 2017 prices

Year ending 31 July	Contribution income	Outgo			Total outgo <sup>1</sup>
	Increasing in line with price increases plus 2.5% to 2034 and 1.75% thereafter	Pension benefits	Other benefits	Expenses	
(1)	(2)	(3)	(4)	(5)	(6)
2018	117.7	135.6	19.4	6.7	161.7
2023	133.6	172.6	21.6	7.2	201.4
2028	144.4	213.7	23.6	7.7	245.0
2033	153.7	244.8	23.8	8.3	276.9
2038	159.4	266.3	24.9	9.0	300.2
2043	164.2	276.1	24.8	9.7	310.6
2048	170.3	279.5	25.9	10.4	315.8
2053	176.8	272.5	24.1	11.2	307.8
2058	185.5	256.6	23.4	12.1	292.1
2063	197.2	240.3	24.0	13.0	277.2
2068	207.8	232.7	24.7	14.0	271.4

<sup>1</sup>Totals may not sum due to rounding

Total outgo is projected to increase from its current level of \$161.7 million in 2018 to \$315.8 million in 2048. Thereafter, total outgo is projected to fall to about \$271.4 million by the end of the projection period (2067). Over the same period, contribution income is projected to increase from \$170.3 million to \$207.8 million.

Figure 4.1 illustrates the projected amounts of contribution income and total outgo, as shown in Table 4.2.

Figure 4.1 Projected Contribution Income and Total Outgo  
(\$ million at constant 2017 prices)

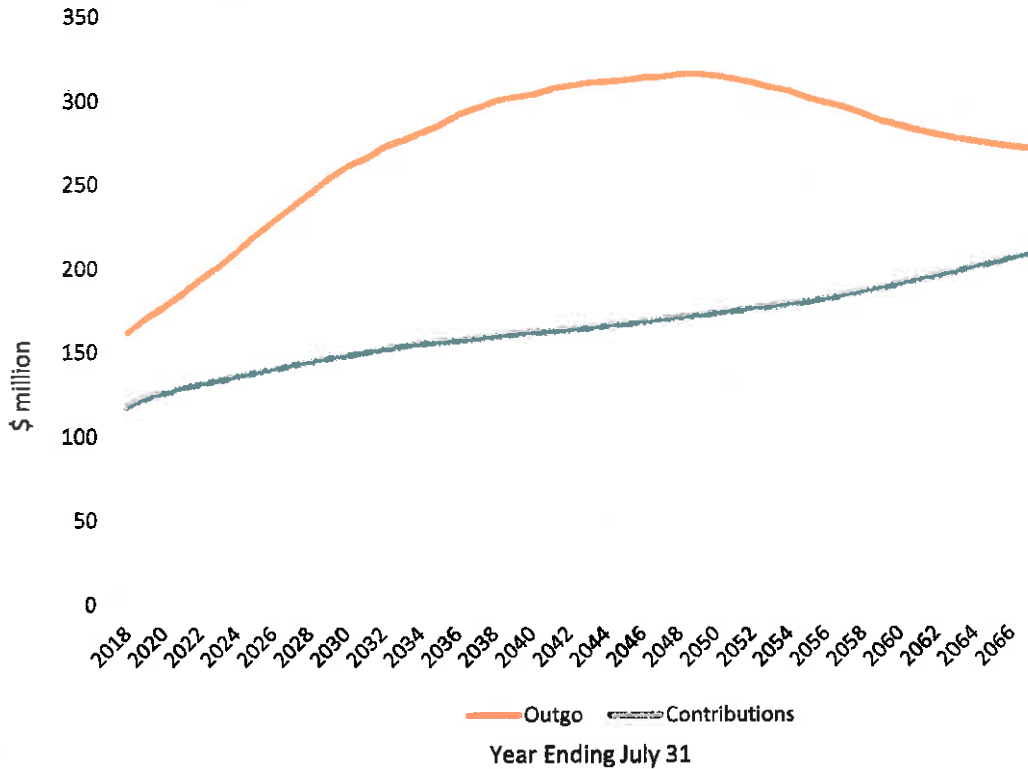


Figure 4.1 indicates that total outgo exceeds contribution income throughout the projection period. By the year 2067, contribution income would need to be 130% of the 2067 level in real terms in order to match the increased level of benefit outgo. This would require contributions to be increased in excess of 3.0% a year more than benefit increases over the next 50 years.

## 4.2 Projected Fund Balance

Projections of the Fund balance are subject to further uncertainty since they depend not only on the projections of income and outgo, but also on future investment returns and changes in market values. However, this is an important aspect of the financing of the benefits and it is useful to consider the expected long-term pattern of growth under the assumptions adopted for the purpose of the projections.

Figure 4.2 illustrates the projected balance of the Fund in constant 2017 price terms, assuming a real rate of investment return of 3½% a year.

Figure 4.2 Projected Fund Balance, Real Rate of Return of 3½% a year  
(\$ million at constant 2014 prices)

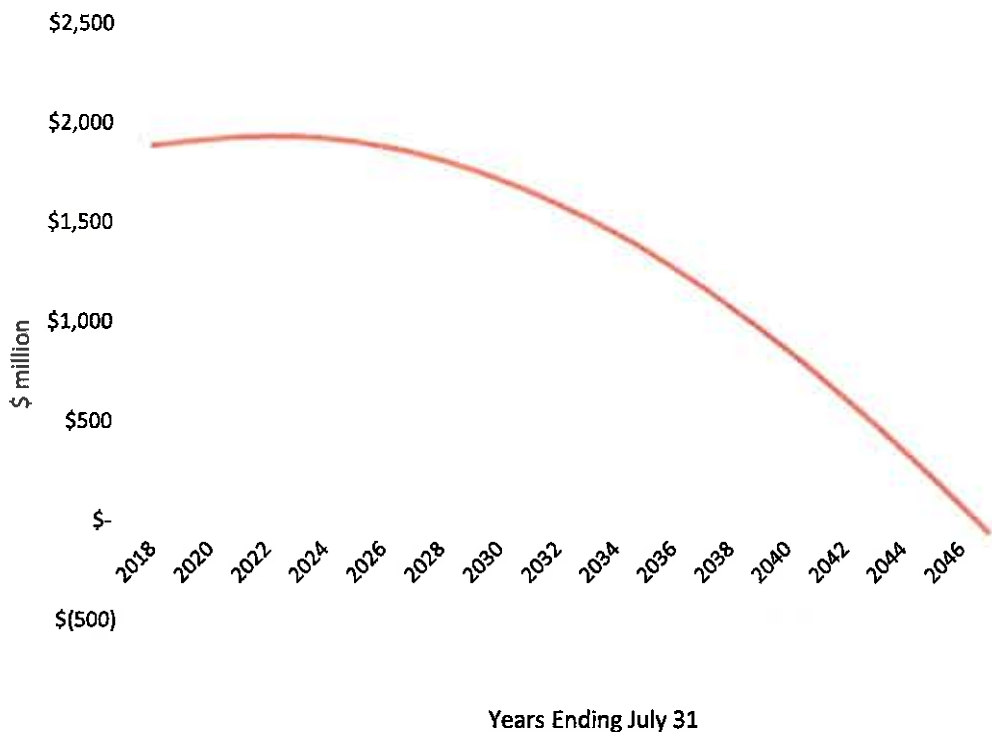


Figure 4.2 indicates that the Fund may be expected to increase in real terms for about 6 years. Thereafter, the Fund is projected to decline steadily until it is completely exhausted in 2047, or after 30 years.

Table H1 of Appendix H shows the Fund projections in detail under the main assumptions, including the multiple by which the projected Fund balance is estimated to cover annual outgo from the Fund ("ratio of Fund to outgo"). At the Review Date, the Fund can cover 11.5 years of annual outgo. The ratio initially decreases gradually and then more rapidly over the projection period.

### **4.3 Comparison with Previous Review**

The following considers the results of the current review, which are expressed in 2017-2018 dollars, relative to the results of the previous review (expressed in 2014-2015 dollars).

The methodology and assumptions adopted for the previous review were maintained for this review and further details are in Appendix F. We also took into consideration the 2018 contribution and benefit rates.

The following explains the projected outlook for the Fund between the previous and the current reviews:

- The previous Review projected a ratio of 'Fund to Total Outgo' of 12.6 in 2014. This compares to a ratio of 11.5 in 2017. The main contributor to the less favourable ratio is the lower than expected return on the Fund.
- Compared to the previous review in which the Fund was projected to be exhausted in 2049, the projection indicates that the Fund may run out 2 years earlier. Table 4.1 shows the impact on the life of the Fund of the various changes in methods and assumptions.
- Contribution income would have to increase by about 30% in real terms (\$232.7m / 279.8m – see year 2068 in Table 4.2) to keep pace with total outgo from the Fund over the next 50 years. This would require an increase in contributions in excess of 3.0% per annum more than benefits. This compares with an increase in contribution of 2.5% per annum more than benefits revealed in the previous review.

## Chapter 5 Variant Projections

The projections presented earlier in this report are based on assumptions of contribution increases and investment returns relative to prices. In this section, we look at the results of these projections under variants of these assumptions. The projections are based on the benefits and contributions in effect from August 2018 and are expressed in constant 2017 price terms.

The variant results show projections of:

- (i) contribution income and outgo (benefits and expenses); and
- (ii) the progression of the Fund balance allowing for investment returns

### 5.1 Variant Rates of Increases to Contributions

The main projections assume that contributions will increase at 2.5% more than prices up to 2034 and 1.75% thereafter, starting with rates effective August 2018. Table 5.1 summarises (at five yearly intervals) the projected income and outgo of the Fund under the following contribution increase assumptions. The results are in constant 2017 prices.

- (a) prices plus 1.75% throughout the projection period
- (b) prices plus 3% up to 2031 and 1.75% thereafter



Table 5.1 - Projected income and outgo (\$million) at constant 2017 prices

Year ending 31 July	Contribution income			Outgo			
	Increasing in line with price increases plus			Pension benefits	Other benefits	Expenses	Total outgo
	2.5%	1.75%	3%				
(1)	(2a)	(2b)	(2c)	(3)	(4)	(5)	(6)
2018	117.7	117.7	117.7	135.6	19.4	6.7	161.7
2023	133.6	129.7	136.2	172.6	21.6	7.2	201.4
2028	144.4	135.2	150.9	213.7	23.6	7.7	245.0
2033	153.7	138.7	160.6	244.8	23.8	8.3	276.9
2038	159.4	142.7	165.3	266.3	24.9	9.0	300.2
2043	164.2	147.0	170.2	276.1	24.8	9.7	310.6
2048	170.3	152.6	176.6	279.5	25.9	10.4	315.8
2053	176.8	158.4	183.4	272.5	24.1	11.2	307.8
2058	185.5	166.2	192.4	256.6	23.4	12.1	292.1
2063	197.2	176.7	204.5	240.3	24.0	13.0	277.2
2068	207.8	186.1	215.5	232.7	24.7	14.0	271.4

Over the next 50 years, contribution income is projected to increase / decrease from \$207.8 million to:

- (i) \$186.1 million under the variant assumption that contribution rates increase at 1.75% more than prices, and
- (ii) \$215.5 million under the variant assumption that contribution rates increase at 3% more than prices.

Figure 5 gives a graphical illustration of the variant results shown in Table 5.1, under the two alternative contribution increase assumptions. Contribution income and total outgo are expressed in constant 2017 price terms. Table G1 of Appendix G shows results for each year of the projection period.

Figure 5.1 - Projected contribution income and total outgo, main and variant assumptions for contribution rate increases (\$ million at constant 2017 prices)

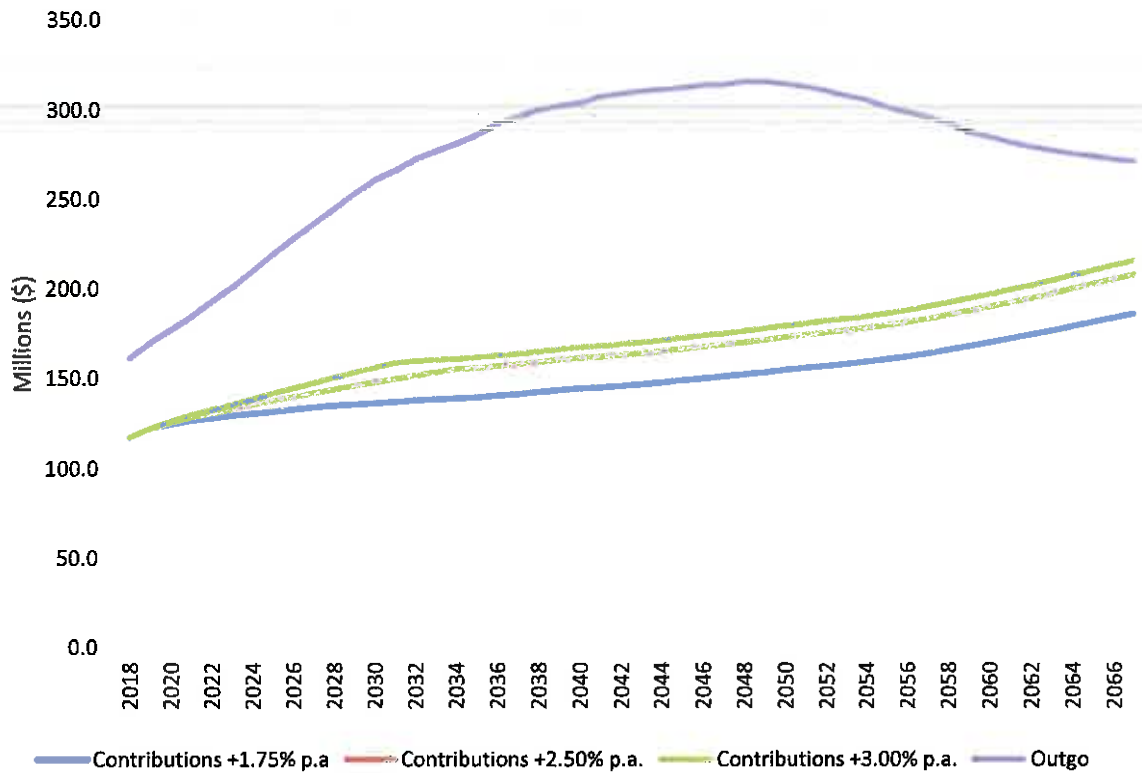


Figure 5.1 indicates that total outgo exceeds contribution income throughout the projection period for all of the scenarios.

## 5.2 Projected Fund Balance

Projections of the Fund balance are subject to further uncertainty since they depend not only on the projections of income and outgo, but also on future investment returns and changes in market values. However, this is an important aspect of the financing of the benefits and it is useful to consider the long-term pattern of growth under the assumptions adopted for the purposes of the projections.

Negative projected Fund values are shown to indicate the potential shortfall in the projected Fund, although we anticipate that appropriate action would be taken to address this situation.

Figure 5.2 shows the effect of the two alternative contribution increases on the projected Fund.

Figure 5.2 - Projected Fund Balance, main and variant assumptions for contribution rate increases, real rate of return of 3% a year (\$ million at constant 2017 prices)

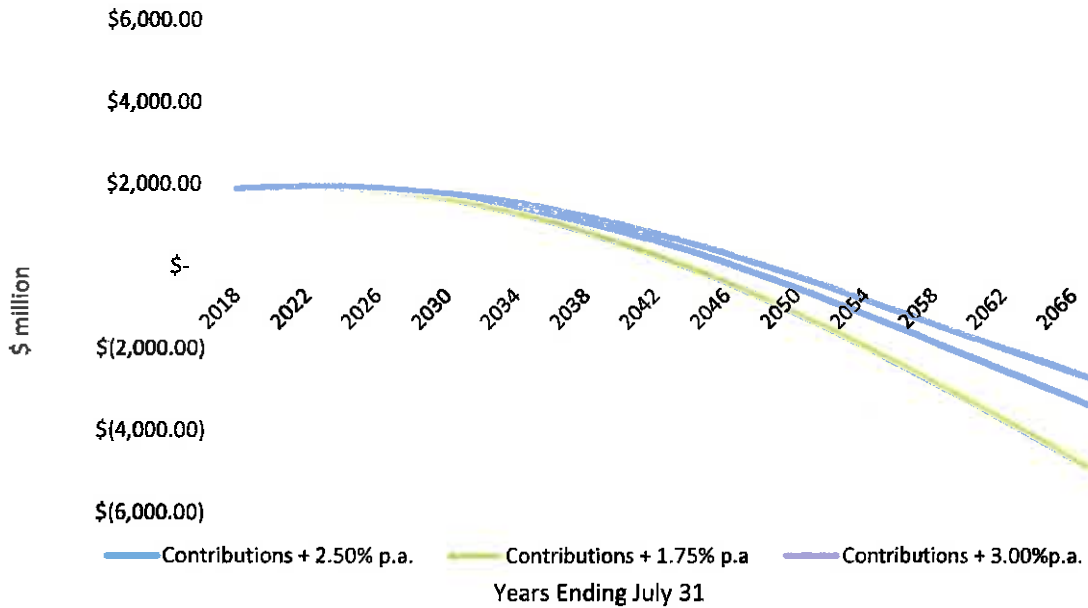


Figure 5.2 shows that the Fund is expected to be exhausted in 2044 (1.75% increase) and 2048 (3% increase).

### 5.3 Variant Fund Returns

Figure 5.3 illustrates the projected Fund balance in constant 2017 price terms, assuming that contributions increase at 2.5% more than prices until 2034 and 1.75% thereafter and assuming alternative real rates of investment return of 2% and 4% a year.

**Figure 5.3 - Projected Fund balance, Real rates of return of 2%, 3.5% and 4% a year. Contributions increase at 2.5% a year more than prices until 2030 and 1.75% thereafter (\$ million at constant 2017 prices)**

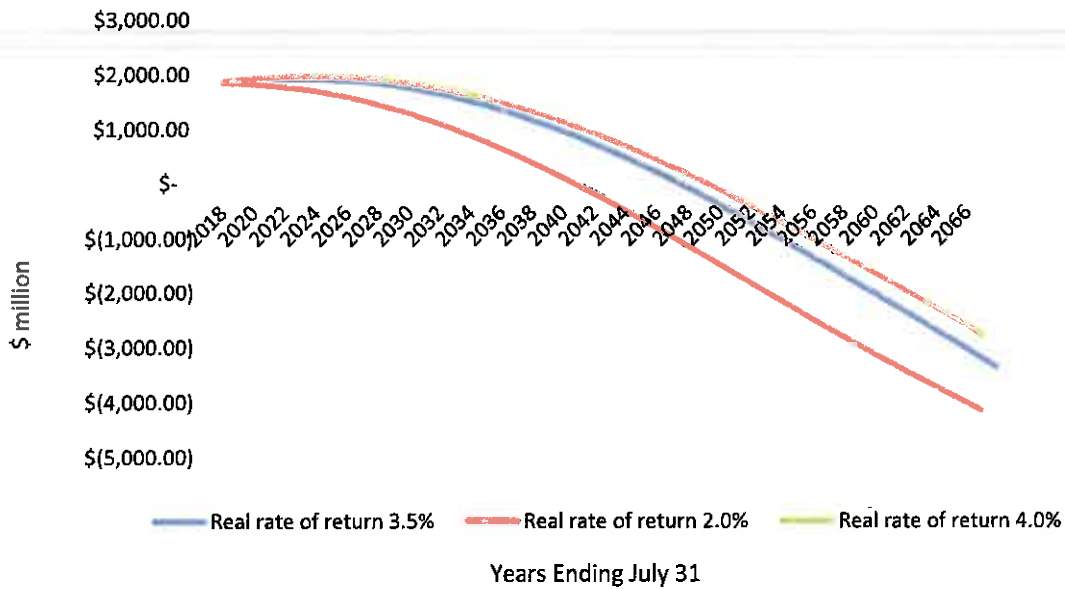


Figure 5.3 shows that if the assumed rate of real investment return decreased to 2% per year, the Fund is projected to decline steadily until it is depleted in 2040. If the assumed real rate of investment return is increased to 4% per year, the Fund increases for the first 7 years then declines steadily until being depleted in 2049, 2 years more than under the best estimate scenario.

## 5.4 Variant: 110% and 90% Contributors

Two additional scenarios were investigated where the number of contributors in the population increased and decreased by 10% respectively. This is analogous to there being lower and higher unemployment without any change in the labour force.

Figure 5.7 illustrates the impact on the Fund balance of increasing and decreasing the contributing population by 10% throughout the projection period.

Figure 5.7 - Projected Fund balance, 110% and 90% Contributors (\$ million at constant 2017 prices)

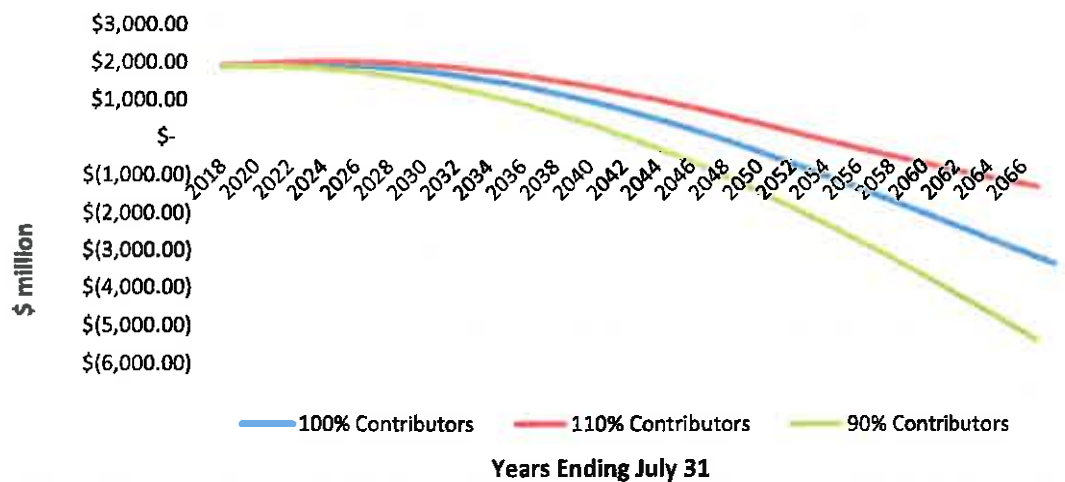


Figure 5.7 shows that a 10% decrease in the number of contributors is projected to reduce the Life of the Fund by 4 years while a 10% increase in the number of contributors is expected to extend, the life of the Fund for 7 years, all other assumptions remaining unchanged.

## 5.5 Additional Scenarios

Some additional design changes were also explored.

In particular, we looked at

- (i) Increasing the retirement age from 65 to 68 over a 5 year period from 2021 to 2026
- (ii) Increasing the retirement age from 65 to 68, increasing the contributions by 3.00% greater than benefits per annum and assuming a real rate of return of 4.00% per annum.

Figure 5.8 - Projected Fund balance, Extend Retirement Age to 68 and Extend Retirement Age to 68 combined with a contributions increasing by 3.00% greater benefits per annum and real rate of return of 4.00% per annum (\$ million at constant 2017 prices)

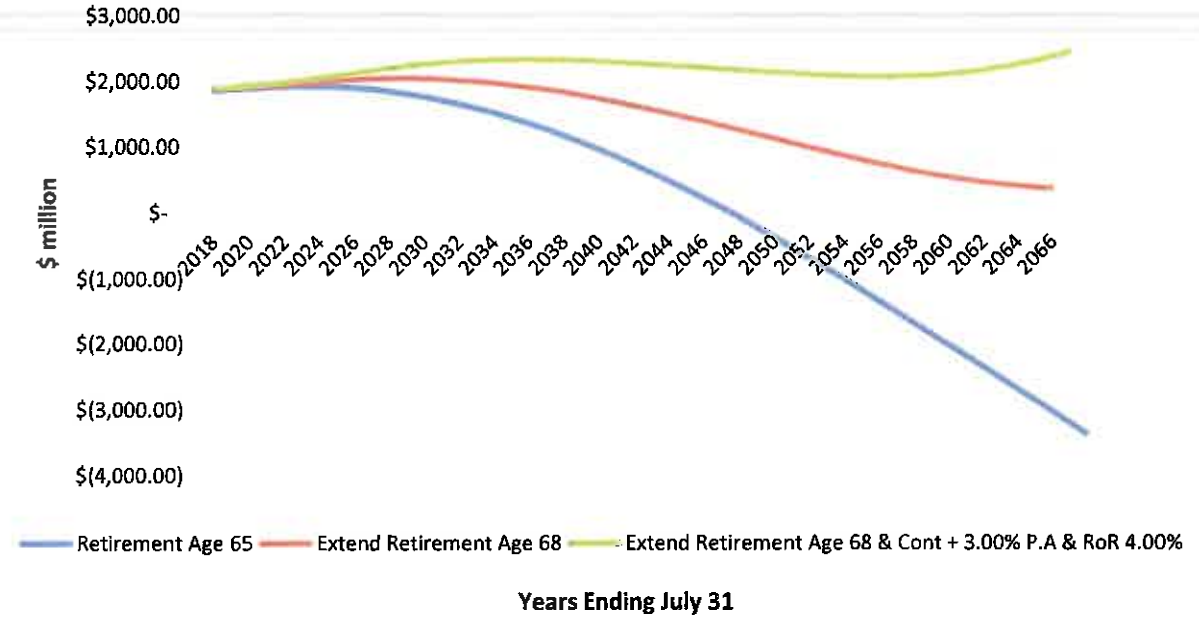


Figure 5.8 shows that extending the retirement age to 68 over a 5-year period will extend the life of the fund for the entirety of the projection period, and extending the retirement age to 68 combined with the 3% per annum contribution increase and the 4.00% real rate of return would make the fund sustainable at the end of the 50 year projection period.

## **5.6 Further Comments**

Tables H1 to H9 of Appendix H show the Fund projections in detail, including the multiple by which the projected Fund balance is estimated to cover annual outgo from the Fund (“Ratio of Fund to Outgo”).

The results demonstrate that a lower real rate of return would cause the Fund to decline more rapidly, whereas a higher real rate of return either delays or reduces the decline of the Fund.

An increase of 10% of the number of contributors, or where contributions increase by 3% more than benefits (up to 2031), both have a moderate positive impact on the Fund but do not result in sustainability of the Fund.

All other things being equal, lower contributions in the short term will give rise to a smaller fund and so, most likely, lead to higher contributions in the longer term.

Overall, the results of the Fund projections demonstrate that in the short to medium term the Fund is sufficient to meet its obligations. However, in the longer term there is considerable uncertainty relating to progress of the Fund in respect of the financial assumptions. Given that seriatim data was provided for the Review and a mortality study was conducted in 2014, there was more certainty around the demographic assumptions, which will continue to be monitored. Since benefit outgo is projected to increase significantly relative to contribution income, there is an argument for smoothing the impact by raising contributions by more than is necessary in the short term, thus building up a sizeable fund. As a result, however, the future outlook would then be more sensitive to the real rates of return achieved in the Fund. This is evident by the results shown in Table H9 where contributions are increased by 3% a year more than prices (up to 2031) and the Fund earns a real rate of return of 4% per annum.

The scenarios showing increased contributors and increased retirement age both have significant impacts on the life of the Fund, indicating that increased economic growth (increased jobs) and an increase in retirement age, which is in line with global retirement age trends and increased longevity, would have positive impacts on the sustainability of the Fund.

## **5.7 Accrued Benefits**

We were also asked to provide an assessment of the accrued and projected benefit obligation of the Fund for existing contributors and beneficiaries at the Review Date.

It should be noted that social security funds, unlike occupational pension plans, are designed and funded on the premise that contribution income from future generations is expected to fund the benefits of current beneficiaries. The aim of the Fund should be sustainability rather than full funding while ensuring that there are sufficient assets to meet several years of benefit payments and expenses at any point in time. At the Review Date, the Fund can meet at least 11.5 years of the current level of benefits and expenses. In a 2014 study done on 14 other Social Security Funds in the Caribbean, Bermuda’s ratio is better than 9 of the countries which average around 7.5 years. By comparison, the ratio for the Canada Pension Plan in 2017 was 6.56 years. The interpretation of this ratio should take into consideration the relationship between the level of contributions and benefits. For countries with

lower ratios, generally their benefit rates are high relative to their contribution rates and vice versa. Maturity of the fund also has an impact on the ratio with younger funds generally having higher ratios.

Based on the valuation assumptions set out in Appendix I, the Fund is estimated to meet 45.0% of projected benefits accrued up to the Review Date in respect of current beneficiaries of the Fund and the current working age population. The Fund is estimated to be 72.1% funded on an accrued basis (no benefit increases). If benefits continue to accrue and contributions are made assuming increases to both, then the Fund is estimated to be 67.2% funded.

Further details of the calculation and the value of accrued and future benefits can be found in Appendix I.

We also calculate the present value of the expected benefit payments and gratuities over the next 10 years, which are \$983 million and \$37 million respectively.



## Chapter 6 Conclusions and Recommendations

The Fund's performance during the inter-valuation period has had a negative impact on the Fund's financial position. The return on investment was lower than expected on both a nominal and a real return basis while Fund expenses were lower than expected. The net impact of increasing benefits and contributions had a slightly positive impact on the Fund.

The viability of the Fund in the short to medium term is good with the Fund being able to cover at least 11 years of the current expenditure and being positive for the next 29 years.

The projections indicate that the future sustainability of the Fund is sensitive to the real rate of investment returns, the rate of increase in contributions relative to benefits, the level of economic activity and the demographic profile of the Bermuda population. Possible design changes such as increasing the retirement age may also contribute to the Fund's sustainability.

In considering the rate at which the contribution rate increases relative to benefits, one should be mindful that the contribution rate could exceed the benefit rate in the future, which would not be a desirable situation. Hence the reason the rate of contribution increase relative to benefits (2.5%) was applied up to 2034 and then reduced thereafter to 1.75%. If a rate of 2.5% were used throughout the projection period, the contribution rate would exceed the benefit rate in 2081.

We recommend that the Department of Social Insurance set a target ratio of benefits to contributions which would help guide how much they could increase contributions relative to benefits in the future. One way of determining this is to project the actual contribution rate for say 40 years at various rates of increase and compare it to average wages which one can assume increases at 1% above prices. Then determine which contribution increases (above prices) are feasible and affordable.

Due to the inherent uncertainty in both the future demographic experience and investment returns on the Fund, the progress and funding level of the Contributory Pension Fund should be kept under regular review.

As presented in Chapter 4 and Appendix I, the CPF is not financially sustainable for the long-term:- assets are 45% of projected accrued liabilities and the fund is projected to be exhausted around 2047. While full funding is not required for national pension systems, there should be a viable financing strategy that ensures that future generations will not be overly burdened or forced to receive significantly reduced benefits.

Recent pronouncements about a change in CPF contribution structure have not been included in this report. Such a change could bring greater equity to the CPF and/or enhance long-term sustainability. Several concerns re CPF benefit determination and administration have also been raised in discussions with the CPF. The results of these actuarial projections and the government's desire for changes to the CPF provide an ideal platform for broad-based discussions about the future of the CPF.

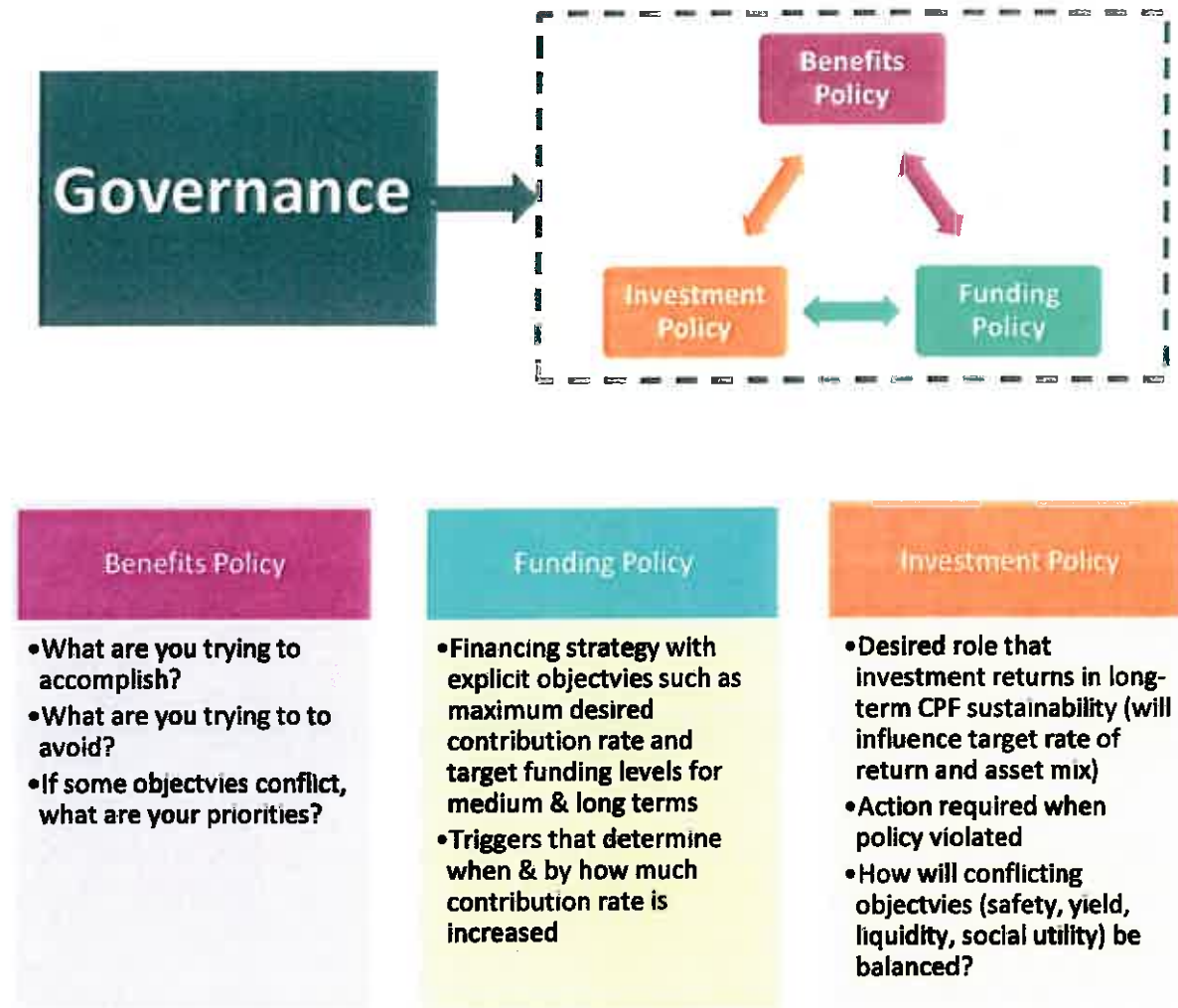
CPF sustainability is inextricably linked to the local economy for contributions. Investment returns are primarily linked to US financial markets. A "good economy" that experiences sustained economic growth

with increasing employment and wage levels is considered the first of the four ingredients necessary for long-term CPF sustainability. The other three ingredients, over which policymakers have greater control, are:

1. **Good design – a system that provides relevant, equitable and affordable benefits that are consistent with prevailing socio-economic and labour market conditions, other employment linked benefits and available technology.**
2. **Efficient & effective administrative systems – low cost accurate record keeping that enables timely and transparent benefit processing.**
3. **Honest & responsible government (good governance) – proactive and prudent decision making in the best long-term interest of Bermuda at all governance levels.**

Good governance not only requires best practices and guidelines for day-to-day operations, but it also requires the following three interconnected policies to prevent undesired outcomes and appropriate and timely responses to actual outcomes.

Figure 6.1. Interconnected Policies for Long-term Sustainability



An Investment Policy is already in place but the CPF does not have a Benefits Policy or a Funding/Contribution Policy.

Given the financial challenges that lie ahead and the lack of any reforms to the CPF, even after the NPS was introduced, we recommend that a comprehensive review of all pensions in Bermuda be conducted. While the 2013 SAGE report contained several recommendations, this review should focus on the following six “good design” objectives:

1. **Coverage:** How well workers of all sectors are covered for income security in old age.
2. **Adequacy:** The ability of pensions to provide a decent standard of living.
3. **Financial sustainability:** The affordability of the system to future contributors and taxpayers.
4. **Work incentives:** Having rules that do not encourage people to cease working but instead encourage them to work longer.

5. **Administrative efficiency: Maintaining accurate records while keeping operating and management costs as low as possible.**
  6. **Diversity: Income security in old age coming from various sources with different financing mechanisms.**
- 
-

## Chapter 7 Statement of Actuarial Opinion

This opinion is given with respect to the Bermuda Contributory Pension Fund (the “Fund”).

We performed a review of the Fund as at 1 August 2017. Our review reflects the provisions of the Fund in effect on 1 August 2017, and in addition, takes into account the contribution and benefit rates effective August 2018.

The financial status of the Fund as at 1 August 2017 was determined based on the Fund information and actuarial assumptions appropriate as at that date.

We hereby certify that, in our opinion, as at 1 August 2017:

- The data on which the actuarial review is based is sufficient and reliable for the purposes of the review.
- The assumptions used are, in aggregate, appropriate for the purposes of the review.
- The methods employed in the review are appropriate for the purposes of the review.

This report has been prepared, and our opinions given, in accordance with *Actuarial Practice Standard 3 (APS3) Social Security Programs of the Caribbean Actuarial Association*. The assumptions that form each actuarial basis used in the report were reasonable at the time this actuarial review report was prepared.

The opinions are given exclusively from a financial viewpoint. This report does not constitute a legal opinion on the rights or duties of the Government of Bermuda, or the members over the Fund. Actuarial reviews are performed based on assumptions and methods that are in accordance with accepted actuarial practice. Emerging experience differing from these assumptions may result in gains or losses, which may affect future results. These will be revealed in future actuarial reviews. The next actuarial review should be performed not later than as at 1 August 2020.

**Morneau Shepell Ltd.**



**Marcia Tam-Marks, F.S.A**  
Fellow of the Society of Actuaries

May 2019

# Appendix A Main Provisions of Scheme from August 2017

## Benefits

A **contributory old-age pension** is payable to any person over age 65, provided that:

- (i) at least 484 contributions have been paid or credited in respect of the person (the minimum was previously 250 contributions and was changed with effect from 4 August 1986 under the Contributory Pensions (Amendment of Contributions and Benefits ) Order 1986); and
- (ii) an average of not less than 25 paid or credited contributions a year has been achieved between attaining age 21 (or 5 August 1968 if later or age 18 if contributions started after the date on which the Age of Majority Act 2001 came into effect) and commencement of pension.

The full rate of pension, payable if the yearly average contributions paid or credited is 50 or more, is \$241.57 a week plus increments of \$1.42 for every 26 contributions paid or credited in excess of 484. The increments are at half this rate for contributions after age 65. If the contribution average is between 25 and 50, lower rates of pension are payable. Although the lower limit for increments was raised from 250 to 484 in 1986, it has remained the same since then. Since 1986, the increment rate has been increased only in line with prices. Effective August 2017 the full rate of pension and excess increment increased to \$241.57 and \$1.42 respectively and increased to \$244.95 and \$1.44 in August 2018.

A **non-contributory old-age pension** is payable to any person aged over 65, who possesses Bermudian status and has been ordinarily resident in Bermuda for a period of not less than 10 years during the 20 years immediately preceding the application for non-contributory pension. These pensions are payable only to persons who are not entitled to a contributory old-age pension. Effective August 2017, the rate of pension is \$110.85 a week, increased to \$114.08 a week for persons whose income from all sources does not exceed \$4,000 a year excluding any pension granted under the scheme. The rate of pension for those below and above the limit increased to \$115.68 and \$112.40 respectively in August 2018.

A **contributory old-age gratuity** is payable to any person reaching age 65 whose contribution record is insufficient to entitle them to an old-age pension. The gratuity is equal to the total of all contributions paid by the person and their employer.

A **contributory widow's allowance** is payable to any widow whose husband has satisfied the contribution requirements for a contributory old age pension at the date of death. If a person becomes a widow under 50 years of age the benefit is for 26 weeks or continues if she has children under school leaving age (the benefit continues until the last child is over school leaving age) or is incapable of self-support, in which case the benefit could continue to age 65. If a person becomes a widow after age 50, the benefit continues to age 65 at which time the person can choose between the widow's allowance and their own pension and will normally choose whichever is higher. In each case, a choice is made at age 65.

The rate of allowance is \$241.57 a week (subject to reduction if the husband's contribution average was less than 50) with an additional \$24.10 a week for each child under school-leaving age. Effective August 2018 the rate of allowance and the additional child benefit increased to \$244.95 and \$24.44.

Where a widow is eligible for a contributory old-age pension, she may elect to receive it in lieu of the widow's allowance. In satisfying the contribution conditions and in arriving at the amount of the contributory pension, her husband's record of contributions may be substituted for her own in respect of any completed contribution year during the period while they were married.

A **contributory widow's gratuity** is payable to a widow whose husband's contribution record is insufficient to entitle her to a widow's allowance, so long as no claim had been made by her husband for an old-age gratuity. The gratuity is equal to the total of all contributions paid by or in respect of her husband.

A **contributory widower's allowance or contributory widower's gratuity** has been payable to widowers whose wives died on or after 16 April 1985, under the same terms and conditions as the corresponding widows' benefits.

A **contributory disability pension** of \$161.02 a week is payable to persons who are incapacitated for a continuous period of 52 weeks or more, subject to certain contribution conditions. In 1988 and 1989, contributory disability pensions were increased only in line with prices. In 1990, however, contributory disability pensions were increased substantially, so as to equal two-thirds of the full rate of contributory old-age pension, excluding increments. This relationship has been maintained. Effective August 2018 the contributory disability pension increased to \$163.27.

A **non-contributory disability pension** of \$110.85 a week is payable if a person does not qualify for a contributory disability pension, is over age 18 and under pension age, has lived in Bermuda for 10 years immediately preceding application for the benefit, and is permanently incapacitated. Since 1985, non-contributory disability pension has been at the same rate as the lower rate of non-contributory old-age pension. Effective August 2018 the non-contributory disability pension increased to \$112.40.

## **Contributions**

Contributions are payable in respect of employed and self-employed persons. The employer pays \$34.47 per week (\$32.07 before August 2016) for each employee, and the employee pays an equal amount if he is under the age of 65. Self-employed persons pay a contribution equal to the joint contribution of employee and employer. Contributions are credited in the case of an unemployed widow(er) under pension age entitled to widow(er)'s allowance. They may also be credited in respect of a person incapacitated from work, if he has paid not less than 150 contributions and was employed immediately prior to his incapacity. The contribution rates remained constant in 2017 and increased to \$35.92 per week effective August 2018.

## **Increases to Benefits and Contributions**

Benefit and contribution rates are reviewed annually by reference to the increase in the CPI over the previous calendar year. Contributions increased by 7.5% in August 2016 and by 4.21% in August 2018. Benefits were increased by 5.0% in August 2016, 1.7% in August 2017 and 1.4% in August 2018.

## Appendix B Benefit and Contribution Rates, 2006 to 2017

### Increases to Benefits and Contributions

Table B1 summarises the annual increases to benefit and contribution rates since August 2006, together with the increase in the CPI over the previous calendar year.

Table B1 - Annual increases in CPI, benefits and contributions

Year	Increase in CPI *	Increase in Benefits †	Increase in Contributions †
2006	3.1%	4.0%	5.75%
2007	3.1%	4.5%	6.25%
2008	3.8%	5.0%	6.75%
2009	4.8%	5.0%	0.0%
2010	1.8%	0.0%	0.0%
2011	2.4%	3.0%	0.0%
2012	2.7%	0.0%	5.5%
2013	2.4%	0.0%	0.0%
2014	1.8%	0.0%	0.0%
2015	1.9%	0.0%	0.0%
2016	1.6%	5.0%	7.5%
2017	1.7%	1.7%	0.0%
Average (3 years to 2017)	1.73%	2.23%	2.50%
Average (10 years to 2017)	2.49%	1.95%	1.93%

\* CPI in previous calendar year.

† Increase in August of calendar year.

Source: [http://subportal.gov.bm/images/Cabinet\\_Office/Dept\\_of\\_Statistics/Docs/ConsumerPriceIndex/Consumer%20Price%20Index%20-%20Jul%2015.pdf](http://subportal.gov.bm/images/Cabinet_Office/Dept_of_Statistics/Docs/ConsumerPriceIndex/Consumer%20Price%20Index%20-%20Jul%2015.pdf)



## Benefit and contribution rates, 2008 to 2018

Table B2 summarises the main rates of benefits and contributions in force for the years commencing August 2001 to August 2017.

Table B2 - Benefit and contribution rates, 2015-2018

Benefits	16/08/15	16/08/16	16/08/17	16/08/18 (estimate)
<b>Contributory Old-Age Pension</b>				
Full pension p.w.	\$226.22	\$237.53	\$241.57	\$244.95
Limit for increments	484	484	484	484
Increment p.w.	\$1.33	\$1.40	\$1.42	\$1.44
<b>Non-Contributory Old-Age Pension</b>				
Income limit p.a.	\$4,000	\$4,000	\$4,000	\$4,000
Pension, for those below limit, p.w.	\$106.83	\$112.17	\$114.08	\$115.68
Pension, for those above limit, p.w.	\$103.81	\$109.00	\$110.85	\$112.40
<b>Contributory Widow's or Widower's Allowance</b>				
Personal rate p.w.	\$226.22	\$237.53	\$241.57	\$244.95
Addition per child p.w.	\$22.57	\$23.70	\$24.10	\$24.44
Contributory Disability pension p.w.	\$150.79	\$158.33	\$161.02	\$163.27
Non-Contributory Disability Pension p.w.	\$103.81	\$109.00	\$110.85	\$112.40
Rate of increase in benefits	0.0%	5.0%	1.7%	1.4%
<b>Contributions</b>				
Contributions p.w.	\$32.07	\$34.47	\$34.47	\$35.92
Total Contributions p.w.	\$64.14	\$68.94	\$68.94	\$71.84
Rate of increase in contributions	0.0%	7.5%	0.00%	4.21%

Table B2 (continued) - Benefit and contribution rates, 2008-2014

Benefits	16/8/08	16/08/09	16/08/10	16/08/11	16/08/12	16/08/13	16/08/14
<b>Contributory Old-Age Pension</b>							
Full pension p.w.	\$209.17	\$219.63	\$219.63	\$226.22	\$226.22	\$226.22	\$226.22
Limit for increments	484	484	484	484	484	484	484
Increment p.w.	\$1.23	\$1.29	\$1.29	\$1.33	\$1.33	\$1.33	\$1.33
<b>Non-Contributory Old-Age Pension</b>							
Income limit p.a.	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000
Pension, for those below limit, p.w.	\$98.78	\$103.72	\$103.72	\$106.83	\$106.83	\$106.83	\$106.83
Pension, for those above limit, p.w.	\$95.99	\$100.79	\$100.79	\$103.81	\$103.81	\$103.81	\$103.81
<b>Contributory Widow's or Widower's Allowance</b>							
Personal rate p.w.	\$209.17	\$219.63	\$219.63	\$226.22	\$226.22	\$226.22	\$226.22
Addition per child p.w.	\$20.87	\$21.91	\$21.91	\$22.57	\$22.57	\$22.57	\$22.57
Contributory Disability pension p.w.	\$139.43	\$146.40	\$146.40	\$150.79	\$150.79	\$150.79	\$150.79
Non-Contributory Disability Pension p.w.	\$95.99	\$100.79	\$100.79	\$103.81	\$103.81	\$103.81	\$103.81
Rate of increase in benefits	5.0%	5.0%	0.0%	3.0%	0.0%	0.0%	0.0%
Contributions	From 4/8/08	4/8/09	4/8/10	4/8/11	4/8/12	4/8/13	4/8/14
Contributions p.w.	\$30.40	\$30.40	\$30.40	\$30.40	\$32.07	\$32.07	\$32.07
Total Contributions p.w.	\$60.80	\$60.80	\$60.80	\$60.80	\$64.14	\$64.14	\$64.14
Rate of increase in contributions	6.75%	0.0%	0.0%	0.0%	5.50%	0.0%	0.0%

## Appendix C Membership Data

Table C1 - Numbers and amounts of monthly benefits in payment

Benefit	As at 1/8/14		As at 1/8/17	
	Number in payment	Amount (\$000 pm)	Number in payment	Amount (\$000 pm)
<b>Contributory old-age pension</b>	8,600	8,912	9,651	10,658
<b>Contributory old-age pension - UK</b>	168	80		
<b>Non-contributory old-age pension:</b>				
higher rate	696	323	1,024	499
lower rate	382	172	386	183
<b>Contributory widow's allowance</b>	1,142	986	1,152	1,036
<b>Contributory widower's allowance</b>	100	80	99	84
<b>Contributory disability pension</b>	187	92	200	106
<b>Non-contributory disability pension</b>	293	132	330	156
<b>Total</b>	<b>11,568</b>	<b>10,776<sup>[1]</sup></b>	<b>12,862</b>	<b>12,723<sup>[1]</sup></b>

[1]: Totals may not sum due to rounding.

Table C2 - Average amounts of monthly benefits in payment

Benefit	Average benefit (\$ pm)	
	2014	2017
<b>Contributory old-age pension</b>	1,036.28	1,104.35
<b>Contributory old-age pension - UK</b>	473.73	-
<b>Non-contributory old-age pension:</b>		
higher rate	464.20	487.41
lower rate	451.08	473.63
<b>Contributory widow's allowance</b>	863.06	899.59
<b>Contributory widower's allowance</b>	796.18	847.53
<b>Contributory disability pension</b>	491.24	530.41
<b>Non-contributory disability pension</b>	451.08	476.63
<b>Gratuity<sup>[1]</sup></b>	-	-
<b>Total</b>	<b>982.56</b>	<b>990.71</b>

[1]: Not sufficient credible data to determine an average.

Table C3 - Contributions data

	2014	2015	2016	2017
<b>Number of contributors<sup>1</sup></b>	<b>34,806</b>	<b>34,835</b>	<b>34,862</b>	<b>34,890</b>
<b>Av. no. of weekly cont. per month</b>	<b>3.55</b>	<b>3.36</b>	<b>3.38</b>	<b>3.45</b>

[1]: Figures for the 12-month period ending July 31

## Appendix D Financial Data

Table D1 - Income and Expenditure - 2015 to 2017 (\$ million)<sup>1</sup>

	Year ending 31 July			1 August 2014 to 31 July 2017
	2015	2016	2017	
<b>Fund at start of year</b>	<b>1,802.0</b>	<b>1,749.6</b>	<b>1,717.2</b>	<b>1,802.0</b>
<b>Income</b>				
Contributions	107.8	106.4	121.7	335.9
Interest and dividends	24.3	19.9	17.0	61.2
Realised gains (losses)	16.8	3.8	135.9	156.5
Unrealised gains (losses)	(59.2)	(13.5)	26.7	(46.0)
F/X gains/(losses)	(2.7)	(0.5)	(0.2)	(3.4)
Other	6.4	1.7	9.0	17.2
<b>Total income</b>	<b>93.3</b>	<b>118.0</b>	<b>310.1</b>	<b>521.3</b>
<b>Expenditure</b>				
Pensions	139.3	142.7	155.8	437.8
Investment Management Fees	3.7	4.4	3.8	11.8
Administrative Costs	2.5	2.9	2.5	7.8
Increase in Bad Debt Provision	0.2	0.5	0.6	1.2
<b>Total expenditure</b>	<b>145.6</b>	<b>150.4</b>	<b>162.7</b>	<b>458.7</b>
Excess of income over expenditure	(52.4)	(32.5)	147.4	62.6
<b>Fund at end of year</b>	<b>1,749.6</b>	<b>1,717.2</b>	<b>1,864.6</b>	<b>1,864.6</b>

Figures may not sum to totals due to rounding

<sup>1</sup>Draft Financials for 2015, 2016, 2017

Table D2 - Fund assets at market value, 31 July 2017

Asset	\$ million <sup>1</sup>	% <sup>1</sup>
<b>Global Equity</b>	757	42.30%
<b>Core Bonds</b>	288	16.10%
<b>High Yield</b>	15	0.80%
<b>Emerging Market Debt</b>	73	4.10%
<b>Global Asset Allocation</b>	68	3.80%
<b>Risk Parity</b>	172	9.60%
<b>Private Markets</b>	115	6.40%
<b>Hedge Funds</b>	175	9.80%
<b>Real Assets</b>	116	6.50%
<b>Cash</b>	9	0.50%
<b>Total Invested Assets</b>	<b>1,790</b>	<b>100.0</b>
<b>Non-Invested Assets</b>	75	
<b>Net Assets Available for Benefits</b>	<b>1,865</b>	

<sup>1</sup> Numbers may not sum to totals due to rounding

**Table D3 - Annual investment returns of Fund**

Year ending 31 July	Nominal % p.a.	Inflation % p.a.	Real % p.a.
	(1)	(2)	(3)
2008	(1.6)	4.7	(6.0)
2009	(11.2)	1.2	(12.3)
2010	13.3	2.3	10.8
2011	16.8	2.8	13.6
2012	0.8	2.5	(1.6)
2013	9.4	1.8	7.5
2014	11.6	1.9	9.5
2015	(1.4)	1.9	(3.2)
2016	0.3	1.6	(1.3)
2017	10.3	1.7	8.5
<b>Average (3 years)</b>	<b>3.0</b>	<b>1.7</b>	<b>1.2</b>
<b>Average (10 years)</b>	<b>4.5</b>	<b>2.2</b>	<b>2.2</b>

*The inflation rates have been restated to reflect the increases from July of year y to year y+1.*

# Appendix E Population Projection

## Introduction

This Appendix describes the assumptions used to prepare the 50-year population projection for Bermuda required for actuarial review of the CPF as at 1 August 2017.

The population projection was based on the latest total population count as at December 31, 2016 as set out in the 2017 Bermuda Digest of Statistics, and using a distribution by age group as set out in Bermuda's Population Projections 2016-2026. Both of these publications are published by the Bermuda Department of Statistics. The fertility and migration assumptions utilized are mostly consistent with those used in the last actuarial review. The mortality assumption was unchanged.

## Base year

The base year for the projections starts at January 31, 2017 (middle of the fiscal year). The population distribution as at January 31, 2017 was assumed to be the same as the December 31, 2016 population as derived from both the 2016 Bermuda Digest of Statistics and Bermuda's Population Projections 2016-2026. This population was used to determine the cash flows for the period August 1, 2016 to July 31, 2017. Projections in future years incorporate a similar methodology. Table E1 summarizes the estimated population in 2017.

Table E1 - Estimated population as at January 31, 2017

Age last birthday	2017 <sup>1</sup>		
	Males	Females	Total
0-19	6,350	6,273	12,623
20-64	19,599	20,500	40,099
>65	4,779	6,301	11,080
All ages	30,728	33,074	63,802

<sup>1</sup> December 31, 2017 population as derived from both the 2016 Bermuda Digest of Statistics and Bermuda's population projections 2016-2026

## Mortality

A mortality study was conducted as part of the previous valuation and the results indicate that actual mortality was lighter than assumed mortality for past actuarial reviews. For this review, we have used maintained the same assumption, namely, the 2014 Canadian Private Mortality Table (Sex Distinct) with generational mortality improvement for ages 18 and above, and the UK GAD interim life table 2005-2007 (sex distinct) for ages less than 18.

Table E2 summarises the projected life expectancy for males and females under the mortality assumptions adopted for the projection.



Table E2 - Expectation of Life

Year to 31 July	Expectation of life at birth		Expectation of life at age 65	
	Males	Females	Males	Females
2017	87.6	91.1	22.4	24.6
2027	88.2	91.6	22.9	25.1
2037	88.8	92.1	23.4	25.6
2047	89.4	92.5	23.9	26.0
2057	90.0	93.0	24.3	26.4
2067	92.2	96.3	22.4	24.6

## Fertility

We have assumed a long-term total period fertility rate (TPFR) of 1.5. This is broadly consistent with the assumption used in the *Bermuda Population Projections 2016 to 2016*. That study states that

*“The assumed total fertility rate (TFR) in 2026 of 1.4 children per woman was based on a three - year average of births recorded from 2015 to 2017. This is in alignment with the United States Census Bureau’s recommendations where the TFR is assumed to remain constant for the next 10 years if the most recent estimated TFR is less than 1.7 births per woman”.*

The Impact of an increase in fertility rate to 2.0 and 2.5 was investigated under the variant scenarios in the a previous actuarial review and projected an extension of the life of the Fund by zero and three years respectively.

We have retained the male/female sex ratio of future births of 0.95:1 for the first five years and graded back to 1.05:1 over the next ten years and remaining so thereafter for future births in this actuarial review.

## Migration

The projection does not include any allowance for future migration, either inward or outward. This is consistent with the assumption used in the *Bermuda Population Projections 2016 -2016*. The same assumption was made for the previous review.

## Results

Tables E3, E4 and E5 summarise, at five-yearly intervals, the projected numbers below age 20, between ages 20 and 64, and over age 65, for males, females, and both sexes combined, respectively. Table E5 also shows the projected numbers of births and the ratio of the number of people between ages 20 and 64 to the number over age 65, commonly known as the “old-age support ratio”. Figure E1 illustrates the results with population split into the three main age groups (below age 20, between ages 20 and 64, and above age 65).

Table E3 - Projected population 2017 - 2067 (Males)

Males				
Year to 31 July	Ages 0-19	Ages 20-64	Ages 65+	Total
2017	6,350	19,599	4,779	30,728
2022	6,228	18,828	5,969	31,025
2027	5,969	17,783	7,378	31,130
2032	5,639	16,694	8,625	30,958
2037	5,454	15,694	9,386	30,533
2042	5,269	14,862	9,731	29,862
2047	5,121	14,159	9,669	28,949
2052	4,976	13,540	9,339	27,855
2057	4,795	13,279	8,604	26,679
2062	4,603	13,100	7,837	25,540
2067	4,427	12,767	7,322	24,516

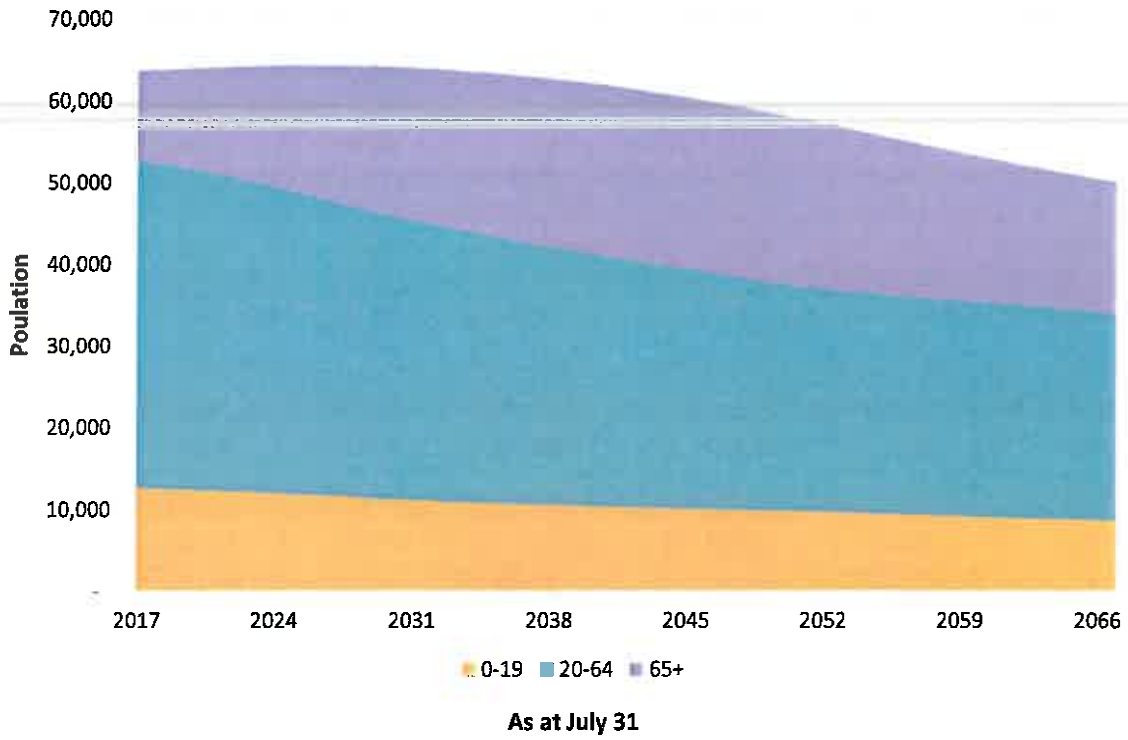
Table E4 - Projected population 2017 - 2067 (Females)

Females				
Year to 31 July	Ages 0-19	Ages 20-64	Ages 65+	Total
2017	6,273	20,500	6,301	33,073
2022	6,012	19,570	7,660	33,241
2027	5,786	18,210	9,299	33,295
2032	5,491	17,093	10,478	33,062
2037	5,219	16,226	11,094	32,539
2042	5,043	15,419	11,294	31,756
2047	4,902	14,545	11,256	30,703
2052	4,764	13,754	10,926	29,444
2057	4,592	13,292	10,203	28,087
2062	4,409	12,998	9,381	26,787
2067	4,241	12,529	8,864	25,633

Table E5 - Projected population 2017 - 2067 (Males and Females)

Males and Females						
Year to 31 July	Births	Ages 0-19	Ages 20-64	Ages 65+	Total	Old-age support ratio
2017	559	12,623	40,099	11,080	63,801	3.6
2022	536	12,239	38,398	13,628	64,266	2.8
2027	505	11,755	35,993	16,678	64,425	2.2
2032	484	11,130	33,787	19,103	64,020	1.8
2037	488	10,672	31,920	20,480	63,072	1.6
2042	471	10,311	30,281	21,025	61,618	1.4
2047	452	10,023	28,703	20,925	59,651	1.4
2052	429	9,740	27,294	20,265	57,299	1.3
2057	411	9,387	26,572	18,807	54,766	1.4
2062	399	9,011	26,098	17,218	52,327	1.5
2067	388	8,668	25,296	16,186	50,149	1.6

Figure E1 - Projected population 2017-2067 (Males and Females)



# Appendix F Estimating Methods

## Introduction

This Appendix describes the methods and assumptions used to project future amounts of benefits and contributions. The assumptions generally reflect the recent experience but with some modifications for the longer-term. It should be noted that the projections are subject to increasing uncertainty in later years.

## Benefits in respect of current beneficiaries

The projected amount of future benefits payable to current beneficiaries is based on seriatim data of persons receiving benefits as at 31 July 2017. This included the person's benefit amount, benefit type, date of birth, sex and contribution history, among other things. In projecting future amounts of benefits payable to current beneficiaries, allowance was made for future mortality and future increases to benefits.

## Benefits in respect of future beneficiaries

Future benefit awards are derived from the projected difference between the Bermuda population and the remaining beneficiaries, and the average benefit rates at the time of the award, trended for future variation (for contributory benefits only). Thereafter new awards are projected allowing for future mortality and future increases to benefits.

In each year of the projection period, the projected population as described in Appendix E is grouped into five categories, which are used to determine the number of persons entitled to specific benefits:

- **Projected population greater than or equal to age 65 adjusted for migrant beneficiaries no longer resident in Bermuda:** This consists of all people greater than or equal to age 65 adjusted by a factor of 104% to account for other people that have satisfied the requirements to receive pension but are no longer resident in the country. This factor was derived as the difference between the actual number of beneficiaries greater than or equal to age 65 in the beneficiary data received, and the number greater than or equal to age 65 as inferred from the population projections as at 31 July 2017.
- **Projected age 65 population adjusted for migrant beneficiaries no longer resident in Bermuda:** This consists of all people age 65 adjusted by a similar factor of 104% to account for other people that have satisfied the requirements to receive gratuities but are no longer resident in the country.
- **Projected males greater than or equal to age 18:** This is inferred from the population projections without adjustment.
- **Projected females greater than or equal to age 18:** This is inferred from the population projections without adjustment.

- Projected males and females greater than or equal to age 18: This is inferred from the population projections without adjustment.

Corresponding beneficiary information from actual data was then used to assign various proportions of the projected population categories, as drivers for the number of beneficiaries for a particular type of benefit, in each projection year. This is detailed in the table below.

This approach takes into consideration all non-Bermudians and over age 65 contributors, hence no separate assumptions have been made in respect of these persons.

Table F1 - Summary of benefit distribution assumptions

Benefit	Population Category Driver	Proportion
Contributory old-age pension (includes UK)	Projected greater than or equal to age 65 population adjusted for migrant beneficiaries no longer resident in Bermuda	83.5%
Non-contributory old-age pension: higher rate	Projected greater than or equal to age 65 population adjusted for migrant beneficiaries no longer resident in Bermuda	8.9%
lower rate	Projected greater than or equal to age 65 population adjusted for migrant beneficiaries no longer resident in Bermuda	3.3%
Contributory widow's allowance	Projected females greater than or equal to age 18	4.1%
Contributory widower's allowance	Projected males greater than or equal to age 18	0.4%
Contributory disability pension	Projected males and females greater than or equal to age 18	0.4%
Non-contributory disability pension	Projected males and females greater than or equal to age 18	0.6%
Gratuity	Projected age 65 population adjusted for migrant beneficiaries no longer resident in Bermuda	Varies by type <sup>1</sup>

<sup>1</sup> See below for details

For all benefits except gratuities, the above numbers are multiplied by the respective average benefit amounts, as detailed in Table C2 of this report, and trended for future variation (for contributory benefits only) to determine projected cash flows for each benefit type in each of the projected years.

For non-contributory gratuities, these were assumed to be received by all non-contributory pension recipients at age 65. For widows and widowers gratuities, these were assumed to be 5.5% and 0.5% respectively, of the projected age 65 population adjusted for migrant beneficiaries no longer resident in Bermuda and estate gratuities were also implicitly accounted for in these numbers. Estimated gratuity amounts varying by type and the projected year were then calculated using contribution history from the actual beneficiary data together with historical (and future indexations) of contribution rates.

Overall, about 96% of the expenditure on benefits is in respect of persons aged over 65. Also about 93% of expenditure is in respect of contributory benefits.

## **Contributions**

The projected amount of contributions is derived from the projected number of future contributors and the proportion of a full 50 weekly contribution premium assumed for each contributor.

The data provided for this review included seriatim data consisting of people contributing for the period 1 August 2014 to 31 July 2017. This included the person's date of birth, sex and the amount of contributions in each of the last three years, among other things.

Labour force participation along with employment and unemployment rates are first determined from the 2017 Labour Force Survey Report published by the Bermuda Department of Statistics. These rates are extrapolated for the various age groups, trended for future years and combined with the population projection to determine an employed population for each of the projected years. The contributor population is then taken as 98.1% of the employed population as this is the adjustment required to equate to the number of contributors who made at least one contribution in the 12 month period ending 31 July 2017 according to the actual contributor data. The number of contributors in the period ending 31 July 2017 was 34,890 relatively stable compared to the number of contributors in the period ending 31 July 2014.

Using the average of the premiums in the financials divided by the implied premiums for the years ending July 31, 2007 to July 31, 2017, the proportion of a full 50 weekly contribution premium was then assumed to be 97.76% for each contributor.

Note that any indexation of premiums was only assumed to be effective after the year ending July 31, 2019.

### **Administration and Investment expenses**

Administration and investment expenses charged to the Fund for the year ending 31 July 2017 totalled \$6.3 million. Similar amounts of \$7.3 million and \$6.2 million were recorded for the years ending 31 July 2016 and 2015 respectively. Of the total expenses in each of the three years, actual administrative costs were \$2.5 million, \$2.9 million and \$2.5 million, respectively. Administration expenses would be expected to be broadly related to both the number of beneficiaries and the level of earnings. Over the long term, it would be reasonable to assume some reduction relative to current expense levels, due to efficiency savings. Investment expenses would be expected to be related to asset size and mix.

For the purposes of the review, we have assumed that total expenses will increase at a real rate of 1.5% a year (i.e. in excess of price increases).



Table F3 - Summary of baseline projection assumptions

<b>Contribution annual increase over CPI</b>		2.50% (1.75% after the year ending July 31, 2034)
<b>Administration expense increase (real)</b>		1.50%
<b>Fund rate of return (real)</b>		3.50%
<b>Joint Contribution rate in 2017</b>		\$ 68.94
<b>- Projection Basis</b>	Bermuda's Population Projections 2016-2026 and the 2000-2030 projection report	
<b>- Mortality Assumption</b>	2014 CPM Private table (sex distinct) for ages greater than or equal to age 18 and UK GAD interim life table 2005-2007 (sex distinct) for ages less than 18	
<b>- Mortality Improvement</b>	2014 CPM Improvement Scale B for ages greater than or equal to 18 and UK GAD 2006 population projection, 50% the applicable Improvement for males, 100% for females for ages less than 18	
<b>- Fertility Rate</b>	1.5%	
<b>- Newborn sex ratio</b>	0.95:1 male to female ratio for the first five years graded to 1.05:1 over the next ten years and remaining so thereafter	
<b>- Benefit rates</b>	Updated to in force July 31, 2018	
<b>- Rate of benefit increase</b>	Actual for 2017 and 2018 and thereafter to match inflation (CPI)	
<b>- Gratuity amounts</b>	Based on contribution assumptions	
<b>- Pension amounts</b>	In accordance with Table C2	
<b>- Rate of contribution increase</b>	Actual for 2017 and 2018 and thereafter CPI plus 2.50% (CPI plus 1.75% after the year ending July 31, 2034)	
<b>- Employed population</b>	Based on extrapolations from the 2017 Labour Force Survey Report	
<b>- Contributing proportion</b>	Static percentage of employed population based on contribution data for the month ending 31 July 2017	

## Appendix G Detailed Results

Table G1 - Projected income and outgo \$ million at constant 2017 prices

Year ending 31 July	Contribution income, increasing in line with prices plus			Outgo <sup>1</sup>			
	2½% <sup>3</sup>	1¾% <sup>4</sup>	3% <sup>4</sup>	Pension benefits	Other benefits	Expenses	Total outgo <sup>1</sup>
(1)	(2a)	(2b)	(2c)	(3)	(4)	(5)	(6)
2018	117.7	117.7	117.7	135.6	19.4	6.7	161.7
2019	122.8	122.8	122.8	143.3	20.1	6.8	170.2
2020	126.0	125.0	126.6	150.1	20.5	6.9	177.4
2021	129.0	127.1	130.3	157.3	20.9	7.0	185.1
2022	131.2	128.3	133.1	165.1	21.4	7.1	193.5
2023	133.6	129.7	136.2	172.6	21.6	7.2	201.4
2024	135.7	130.8	139.0	180.9	22.3	7.3	210.4
2025	137.9	132.0	142.0	189.8	22.9	7.4	220.0
2026	140.1	133.1	145.0	198.1	23.1	7.5	228.7
2027	142.2	134.1	147.9	205.9	23.2	7.6	236.7
2028	144.4	135.2	150.9	213.7	23.6	7.7	245.0
2029	146.4	136.0	153.7	221.8	24.1	7.8	253.7
2030	148.1	136.6	156.3	229.0	24.1	8.0	261.0
2031	150.0	137.3	159.0	234.4	23.6	8.1	266.1
2032	151.9	138.1	159.9	240.3	24.2	8.2	272.7
2033	153.7	138.7	160.6	244.8	23.8	8.3	276.9
2034	155.4	139.2	161.1	248.9	23.9	8.4	281.3
2035	156.1	139.8	161.9	253.2	24.3	8.6	286.0
2036	157.2	140.8	163.1	258.6	25.3	8.7	292.6
2037	158.1	141.7	164.0	262.6	24.8	8.8	296.2
2038	159.4	142.7	165.3	266.3	24.9	9.0	300.2
2039	160.6	143.8	166.5	268.8	24.4	9.1	302.3
2040	161.7	144.8	167.7	270.5	24.2	9.2	161.7

Year ending 31 July	Contribution income, increasing in line with prices plus			Outgo <sup>3</sup>			
	2½% <sup>1</sup>	1¾%	3% <sup>1</sup>	Pension benefits	Other benefits	Expenses	Total outgo <sup>1</sup>
2041	162.9	145.4	168.3	273.0	25.1	9.4	307.5
2042	163.2	146.2	169.3	274.8	24.8	9.5	309.1
2043	164.2	147.0	170.2	275.1	24.8	9.7	310.6
2044	165.4	148.1	171.5	276.9	24.7	9.8	311.4
2045	166.8	149.4	173.0	277.5	24.9	9.9	312.4
2046	167.8	150.3	174.0	278.4	25.4	10.1	313.9
2047	169.1	151.4	175.3	278.7	25.3	10.2	314.3
2048	170.3	152.6	176.6	279.5	25.9	10.4	315.8
2049	171.7	153.8	178.1	279.5	25.6	10.5	315.7
2050	173.1	155.0	179.5	278.7	25.2	10.7	314.6
2051	174.4	156.2	180.8	277.2	24.7	10.9	312.8
2052	175.7	157.4	182.2	275.1	24.4	11.0	310.6
2053	176.8	158.4	183.4	272.5	24.1	11.2	307.8
2054	178.1	159.5	184.7	270.0	24.3	11.4	305.6
2055	179.7	160.9	186.3	266.5	23.5	11.5	301.5
2056	181.4	162.5	188.1	263.3	23.7	11.7	298.7
2057	183.3	164.2	190.1	260.3	23.9	11.9	296.1
2058	185.5	166.2	192.4	256.6	23.4	12.1	292.1
2059	187.6	168.0	194.5	252.5	22.8	12.3	287.6
2060	190.0	170.2	197.0	249.1	23.5	12.4	285.0
2061	192.4	172.3	199.5	245.8	23.5	12.5	281.9
2062	194.6	174.3	201.8	242.9	23.8	12.8	279.5
2063	197.2	176.7	204.5	240.3	24.0	13.0	277.2
2064	200.1	179.2	207.5	238.0	24.3	13.2	275.6
2065	202.6	181.5	210.1	236.1	24.5	13.4	273.9
2066	205.3	183.9	212.9	234.3	24.6	13.6	272.5
2067	207.8	186.1	215.5	232.7	24.7	13.8	271.2

<sup>1</sup>Totals may not sum due to rounding.

<sup>2</sup>Increases up to 2034 and 1.75% thereafter

<sup>3</sup>Outgo columns are only representative of contribution income increasing 2½% in line with prices up to 2034 and 1.75% thereafter. Other margins of increase would change gratuity amounts and thus vary total outgo marginally.

## Appendix H Projections of Fund Balance

Table H1 - Contributions increase at prices plus 2½%, Real rate of return of 3½% pa, constant 2017 prices

Year ending 31 July	Contribution income \$ million	Total Outgo \$ million	Estimated Fund \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,885.1	11.7
2023	133.6	201.4	1,929.6	9.6
2028	144.4	245.0	1,813.6	7.4
2033	153.7	276.9	1,522.2	5.5
2038	159.4	300.2	1,078.2	3.6
2043	164.2	310.6	493.8	1.6
2048	170.3	315.8	(208.5)	(0.7)
2053	176.8	307.8	(1,001.6)	(3.3)
2058	185.5	292.1	(1,830.9)	(6.3)
2063	197.2	277.2	(2,666.8)	(9.6)
2068	207.8	271.2	(3,358.3)	(12.4)

Table H2 - Contributions increase at prices plus 1¼%, Real rate of return of 3½% pa, constant 2017 prices

Year ending 31 July	Contribution income \$ million	Total Outgo \$ million	Estimated Fund \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,885.1	11.7
2023	129.7	201.4	1,919.7	9.5
2028	135.2	244.9	1,764.1	7.2
2033	138.7	276.7	1,395.7	5.0
2038	142.7	299.8	840.0	2.8
2043	147.0	310.2	120.7	0.4
2048	152.6	315.2	(744.2)	(2.4)
2053	158.4	307.2	(1,733.6)	(5.6)
2058	166.2	291.4	(2,800.1)	(9.6)
2063	176.7	276.4	(3,923.3)	(14.2)
2068	186.1	270.2	(4,887.3)	(18.1)

**Table H3 - Contributions increase at prices plus 3%, Real rate of return of 3% pa, constant 2017 prices**

Year ending 31 July	Contribution income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,885.1	11.7
2023	136.2	201.4	1,936.4	9.6
2028	150.9	245.1	1,847.6	7.5
2033	160.6	277.0	1,605.0	5.8
2038	165.3	300.4	1,207.3	4.0
2043	170.2	310.9	678.8	2.2
2048	176.6	316.1	43.7	0.1
2053	183.4	308.0	(668.4)	(2.2)
2058	192.4	292.4	(1,400.2)	(4.8)
2063	204.5	277.6	(2,118.2)	(7.6)
2068	215.5	271.6	(2,698.2)	(9.9)

**Table H4 - Contributions increase at prices plus 2%, Real rate of return of 2% pa, constant 2017 prices**

Year ending 31 July	Contribution income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,857.4	11.5
2023	133.6	202.0	1,749.1	8.7
2028	144.4	245.8	1,466.0	6.0
2033	153.7	277.7	1,005.3	3.6
2038	159.4	301.1	401.9	1.3
2043	164.2	311.5	(319.1)	(1.0)
2048	170.3	316.7	(1,122.9)	(3.6)
2053	176.8	308.6	(1,970.3)	(6.4)
2058	185.5	292.9	(2,797.0)	(9.6)
2063	197.2	278.0	(3,565.7)	(12.8)
2068	207.8	272.0	(4,152.0)	(15.3)

Table H5 - Contributions increase at prices plus 2½%, Real rate of return of 4% pa, constant 2017 prices

Year ending 31 July	Contribution Income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,894.3	11.7
2023	133.6	202.0	1,988.8	9.9
2028	144.4	245.8	1,932.0	7.9
2033	153.7	277.7	1,706.9	6.2
2038	159.4	301.1	1,333.3	4.4
2043	164.2	311.5	820.7	2.6
2048	170.3	316.7	188.4	0.6
2053	176.8	308.6	(539.3)	(1.8)
2058	185.5	292.9	(1,310.6)	(4.5)
2063	197.2	278.0	(2,097.7)	(7.5)
2068	207.8	272.0	(2,758.6)	(10.1)

Table H6 - Same as H1 except 110% of contributor population

Year ending 31 July	Contribution income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	129.5	161.7	1,897.1	11.7
2023	146.9	201.4	2,013.9	10.0
2028	158.8	245.0	1,990.0	8.1
2033	169.1	276.9	1,813.5	6.6
2038	175.3	300.2	1,509.9	5.0
2043	180.6	310.6	1,095.2	3.5
2048	187.4	315.8	597.2	1.9
2053	194.5	307.8	50.5	0.2
2058	204.1	292.1	(482.4)	(1.7)
2063	217.0	277.2	(960.3)	(3.5)
2068	228.6	271.2	(1,312.7)	(4.8)

Table H7 - Same as H1 except 90% of contributor population

Year ending 31 July	Contribution income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	105.9	161.7	1,873.1	11.6
2023	120.2	201.4	1,845.4	9.2
2028	130.0	245.0	1,637.2	6.7
2033	138.4	276.9	1,231.0	4.5
2038	143.4	300.2	646.5	2.2
2043	147.8	310.6	(107.5)	(0.4)
2048	153.3	315.8	(1,014.2)	(3.2)
2053	159.1	307.8	(2,053.6)	(6.7)
2058	167.0	292.1	(3,179.4)	(10.9)
2063	177.5	277.2	(4,373.3)	(15.8)
2068	187.0	271.2	(5,404.0)	(19.9)

Table H8 – Extend Retirement Age to 68

Year ending 31 July	Contribution income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,885.1	11.7
2023	137.0	189.7	1,956.0	10.3
2028	155.0	213.0	2,045.5	9.6
2033	164.2	251.0	2,020.1	8.1
2038	171.1	272.4	1,876.3	6.9
2043	175.6	286.5	1,630.2	5.7
2048	182.6	291.6	1,329.4	4.6
2053	187.7	290.8	1,000.1	3.4
2058	195.9	276.5	690.3	2.5
2063	208.3	260.6	466.4	1.8
2068	220.4	252.6	367.2	1.5

Table H9 – Extend Retirement Age to 68, Contributions 3.00% greater than benefits, 4.00% real rate of return

Year ending 31 July	Contribution income \$ million	Total outgo \$ million	Estimated Fund balance \$ million	Ratio of Fund to outgo = (4)/(3)
(1)	(2)	(3)	(4)	(5)
2018	117.7	161.7	1,894.3	11.7
2023	139.7	189.8	2,025.2	10.7
2028	161.9	213.1	2,211.0	10.4
2033	171.6	251.2	2,321.9	9.2
2038	177.5	272.6	2,329.1	8.5
2043	182.1	286.7	2,262.4	7.9
2048	189.3	291.9	2,173.3	7.5
2053	194.7	291.1	2,094.3	7.2
2058	203.2	276.8	2,081.6	7.5
2063	216.0	261.0	2,214.0	8.5
2068	228.6	253.0	2,453.2	9.7



## Appendix I      **Accrued Benefits**

The Department has asked us to provide an assessment of accrued benefits as was done in the previous review. The assessment is in respect of existing and future beneficiaries from the existing population as of 31 July 2017. In particular, an assessment of the following is provided:

- The **Accrued Benefit Obligation (the ABO)**. This is the value of the pension and other benefits accrued in respect of contributions paid to date into the Fund excluding allowance for future increases to benefits.
- The **Projected Benefit Obligation (the PBO)**. This is the same as the ABO except that allowance is made for future increases to benefits.
- The **Present Value of Future Benefits (the PVFB)**. This is the value of the total benefits payable to existing members and beneficiaries in the future in respect of past and future expected contributions. Allowance is made for future benefit increases.
- The present value of retired liabilities over the next 10 years for existing beneficiaries.
- The present value of expected gratuity payments over the next 10 years.

It should be noted that the assessments mentioned above in this appendix do not include any provision for future administrative expenses.

It should also be noted that the funding policy for the Fund is not based on full actuarial funding but based on sustainable funding. That is, contributions plus investment income should cover benefits and administration expenses on an annual basis while the fund builds up sufficient reserves to cover several years of benefits and expenses to withstand future adverse circumstances.

### **Assumptions**

The ABO has been estimated by discounting expected future payments, excluding administration expenses, at 6% a year nominal, which is broadly equivalent to assuming future price increases of about 3% a year and a real rate of return (in excess of prices) of 3% a year. The PBO and PVFB have been estimated by assuming that benefits increase in line with future prices discounting future benefit payments in respect of both past and future service at a real rate of return of 3% a year.

All other applicable demographic and financial assumptions mentioned in appendix Table F1 were used in estimating these amounts. The assessment is based on the actual demographic and benefit data provided for the review and no new entrants are assumed.

Table I1 - The ABO, PBO and PVFB as at 31 July 2017

(\$million at constant 2014 prices)

Yr. Ending 31 July	2017 <sup>2</sup>		
	ABO	PBO	PVFB
<b>Accrued Rights</b>			
Current Beneficiaries	1,378	1,604	1,604
Future Beneficiaries <sup>1</sup>	1,207	2,446	2,446
<b>Total accrued rights</b>	<b>2,585</b>	<b>4,140</b>	<b>4,140</b>
<b>Future Service Rights</b>			
Future Beneficiaries <sup>1</sup>	-	-	2,159
<b>Total service rights</b>	<b>2,585</b>	<b>4,140</b>	<b>6,300</b>
Present Value of Future Contributions	-	-	2,371
Assets per accounts	1,865	1,865	1,865
<b>Total Assets</b>	<b>1,865</b>	<b>1,865</b>	<b>4,235</b>
<b>Ratio</b>	<b>72.1%</b>	<b>45.0%</b>	<b>67.2%</b>

<sup>1</sup>In the last actuarial review, only the contributors were valued as future beneficiaries; the 2017 value includes non-contributors who are entitled to future benefits

<sup>2</sup>Totals may not sum due to rounding

The ABO, which assumes no further increases to benefits, is estimated to be \$2,585 million as at 31 July 2017. The Fund at \$1,865 million covers approximately 72.1% of the accrued benefits (excluding future administration expenses).

As at 31 July 2017, the estimated accrued liability assuming future increases to benefits and valued at a real return of 3% per annum, is \$4,140 million. The Fund at \$1,865 million covers approximately 45.0% of the accrued benefits (excluding future administration expenses). This level of coverage is lower than that indicated in the previous review (48.4%).

The PVFB for the total expected period of participation in the Fund is estimated to be \$6,300 million as at 31 July 2017. The present value of expected future contributions is estimated to be \$2,371 million as at 31 July 2017. The Fund along with future contributions covers approximately 67.2% of both current and future benefits (excluding future administration expenses).

### Present value of retired liabilities and gratuities

As at 31 July 2017, the present value of retired liabilities for existing beneficiaries over the next 10 years is estimated to be \$983 million.

The present value of gratuities expected to be paid over the next 10 years, assuming that contribution rates increase at 2.5% a year in excess of benefit increases is estimated to be \$37 million.

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