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THE PENSION VALUATION ASSUMPTIONS PROJECT

Prepared by: The Actuarial Division

Financial Services Commission

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Acknowledgement

The preparers of the report extend gratitude to the members of the Pensions and Actuarial Divisions. The Pensions Division assisted in gathering the valuation reports used in the survey. The Actuarial Division completed the analysis of the data, authored and peer reviewed the report.

The members of the Actuarial Division involved in the project are:

Jason Logan
Shiloh Waite
Sharifa McLeod
Nadeya Cleghorn
Jevaughn Clarke
Jamion Shreeves
Angela Beckford

Executive Summary

Pension plans and schemes can be classified as either Defined Benefit ("DB") or Defined Contribution ("DC"). In DC arrangements, where members and/or employers contribute to members' accounts, valuations are relatively straight-forward. However, the valuation of DB plans requires the plan's actuary to make assumptions of several factors (e.g. probability of a member remaining in a plan, projected salary at the date of termination, interest rate for discounting payment streams) that, at the date of valuation, are unknown.

The Caribbean Actuarial Association (CAA) issues actuarial standards of practice to which their members must adhere while performing actuarial services within the Caribbean. Actuarial Practice Standard 0: General Actuarial Practice (APS0) and Actuarial Practice Standard 1: Pension Schemes – Actuarial Valuation Reports (APS1) are the CAA standards that are applicable to the valuation of pension plans. The standards do not prescribe a specific methodology for determining assumptions – demographic or economic. Actuaries, however, are expected to set assumptions after giving due consideration to the requirements of the standards.

The objective of this report is to provide the results of a survey of valuation methodologies and assumptions used in the valuations of DB plans during the period December 31, 2016 to December 31, 2017, inclusive. The aim of the survey is to increase awareness among members of plans, trustees, administrators, investment managers and other professionals in the pension industry of the range of actuarial practice in Jamaica.

Twenty (20) DB pension plans with funding valuation dates between December 31, 2016 and December 31 2017 (inclusive) were reviewed. The valuations were performed by four (4) actuaries, all of whom are members of the CAA. They are subject to the actuarial practice standards issued by the CAA. The main findings are set out in the table below:

Assumption	Findings
Funding Methodology	Two funding methods were used in the valuations in the survey; the Projected United Credit and Attained Age Methods. Overall, the distribution of approaches used is approximately even. However, the ratio of PUC to AA usage changes significantly when analysed by size with the ratios for small to large plans being 1:2 and 1.8:1 respectively.
Economic Assumptions – Discount Rates and Inflation Rates	Nominal discount rates for the 20 plans ranged from 8.0% to 9.0%, with the average being 8.43%. Nominal rates are lower than the yields on 35 year Government of Jamaica bonds which were 12.12% and 9.98% as at December 31, 2016 and 2017, respectively. 15 plans explicitly stated the inflation assumption; with the assumptions falling between 6% and 7% at or slightly above the medium-term inflation target for Jamaica of 4% - 6%.

Assumption	Findings
Mortality	Pre-Retirement mortality assumptions varied considerably. Eight (8) assumed no deaths, five (5) provided specimen tables, one (1) was based on the A1967-70 Mortality Table for Assured Lives, and the rest on 1994 Group Annuity Mortality Table (GAM94). GAM94 was the base table used to model post-retirement mortality. The SOA mortality improvement Scale AA was used in six (6) valuations. For six (6) plans, age was rated down by five years (for example: for a person aged 60, the mortality rate for a 55 year old will be used) to adjust for experience and mortality improvement. There was no explicit mortality improvement assumption in eight (8) reports.
In Service Termination Rates other than Mortality	Withdrawal Rates – 13 or 65% used a withdrawal decrement table. Four (4) of the six (6) small plans assumed no withdrawals. Ill health Retirement – 25% used an ill-health retirement decrement table. Early Retirement – 3 made explicit provision for early retirement by loading the normal retirement provision (NRP), providing a range for the normal retirement age, or by providing an allowance for individuals depending on years of service. Late Retirement – All members were assumed to retire at normal retirement age and as such no decrement was assumed.
Salary Increase	All the actuaries had a salary increase assumption with the average being 7.23%. Real salary increase assumptions ranged from 0% to 1.5%.
Pension Increase	Future pension increases were assumed for only three (3) of the 20 plans surveyed. For the other plans, pension increases are discretionary.
Expense	All the actuaries had an expense assumption. The four methodologies used to account for expenses were expressed as a percentage of (a) the member's contributions, (b) joint contributions, (c) pensionable salaries; and (d) assets. If the assumptions were expressed as a percentage of total assets, expenses were assumed to be between 0.1% and 1.5% of assets.
Margins for Adverse Deviation	Margins for adverse deviations were incorporated implicitly.

Contents

Section 1: Introduction

Pension plans and schemes vary in terms of the types of the benefits they provide. They can be classified as either Defined Benefit ("DB") or Defined Contribution ("DC"). A DB plan is a pension plan which promises a specified benefit at retirement. The stated benefit may be an exact dollar amount or more commonly, based on a predetermined formula using factors such as salary and service[1]. In DC arrangements, members or employers (or both) contribute to members' accounts, often times defined as a percentage of salary or remuneration. These contributions as well as bonuses and monies transferred from other pension plans are invested, and the member receives a benefit from their account balance (i.e. accumulated contributions, bonuses, transfer values and investment gains or losses).

The valuation of DC arrangements is relatively straight-forward, equalling the value of members' accounts as at the date of the assessment. However, the valuation of DB plan liabilities involve the plan's actuary making assumptions of several factors (e.g. probability of a member remaining in a plan, projected salary at the date of termination, interest rate for discounting payment streams) that, at the date of valuation, are unknown.

The process of setting assumptions is a core part of the work of an actuary. It is a task that requires the actuary to apply his/her technical knowledge and professional judgment.[2] In addition to developing appropriate assumptions, the actuary must also clearly communicate the rationale behind each assumption so that users of his/her actuarial reports can understand them and make informed decisions.

The Caribbean Actuarial Association (CAA) issues actuarial standards of practice to which their members must adhere while performing actuarial services within the Caribbean. Actuarial Practice Standard 0: General Actuarial Practice (APS0) and Actuarial Practice Standard 1: Pension Schemes – Actuarial Valuation Reports (APS1) are the CAA standards that are applicable to the valuation of pension plans. APS0 provides general guidance which is applicable to all actuarial work, while APS1 sets out the minimum information that must be contained in a report on an actuarial valuation of an on-going DB pension plan. The standards do not prescribe a specific methodology for determining assumptions. Actuaries, however, are expected to set assumptions after giving due consideration to the requirements of the standards. Assumptions must be reasonable in aggregate. The actuary may test the reasonableness of their assumptions by regularly conducting an analysis of actual plan experience to expected or assumed experience or by reviewing the pattern and magnitude of actuarial gains and losses. **Appendix 1** contains the main provisions of APS0 and APS1 that relate to assumptions set by an actuary.

The objective of this report is to provide the results of a survey of valuation methodologies and demographic and economic assumptions used in the valuations of DB plans during the period December

[1] https://www.nber.org/chapters/c6047.pdf
[2] https://www.soa.org/globalassets/assets/files/edu/edu-2009-fall-ea-assess-sn.pdf

31, 2016 to December 31, 2017, inclusive. The aim of the survey is to increase awareness among members of plans, trustees, administrators, investment managers and other professionals in the pension industry of the range of actuarial practice in Jamaica.

The remainder of the report will take the following structure:

- Section 2: Data and Methodology of Survey
- Section 3: Funding Methodology
- Section 4: Economic Assumptions: Discount and Inflation
- Section 5: Mortality
- Section 6: In-service Termination Rates other than Mortality
- Section 7: Salary Increases
- Section 8: Pension Increase
- Section 9: Expense Assumption
- Section 10: Margins for Adverse Deviations
- Section 11: Conclusion

Section 2: Data and Methodology of Survey

For the survey, 20 Actuarial Valuation Reports (AVR) of DB Plans with effective valuation dates between December 31, 2016 and December 31, 2017, inclusive, were examined. The plans in the sample set were of varying sizes both in terms of active membership and fund assets. The AVRs were prepared by four (4) actuaries, all of whom are members of the CAA. They are subject to the actuarial practice standards issued by the CAA. The assumptions and plan statistics were collected (See **Appendix 2** for a detailed breakdown of the data) and statistical analysis undertaken. The key findings of the survey are presented in the following sections.

Section 3: Funding Methodology

The Funding Method of a pension plan may be viewed as the payment or budgetary scheme under which benefit payments are financed. The selection of a funding method does not affect the overall true cost of a plan; it is a technique used to estimate the cost at a particular point in time. There are six main categories of Funding Methods of pension plan financing. At the basic end, no assets are set aside to meet the liabilities ("Pay as you go" and "Terminal funding") while at the extreme end, there is heavy pre-funding of future benefits. In between, lay the two major classes of actuarial funding methodologies: Accrued Benefit and Prospective funding methods.

The Accrued Benefit funding methods seek to create a linkage between the fund assets and accrued liabilities by establishing a level of contributions that would meet the funding objective of the plan (i.e. provide pension benefits when they become due). They are 'security driven'. The two main methods in this category are the Current Unit Credit and Project Unit Credit methods.

In contrast to the security driven Accrued Benefit approaches, Prospective funding methods seek to ensure stability of contributions. They are, therefore, referred to as 'contribution driven'. The three commonly used methods within this category are the Attained Age, Aggregate and Entry Age methods.

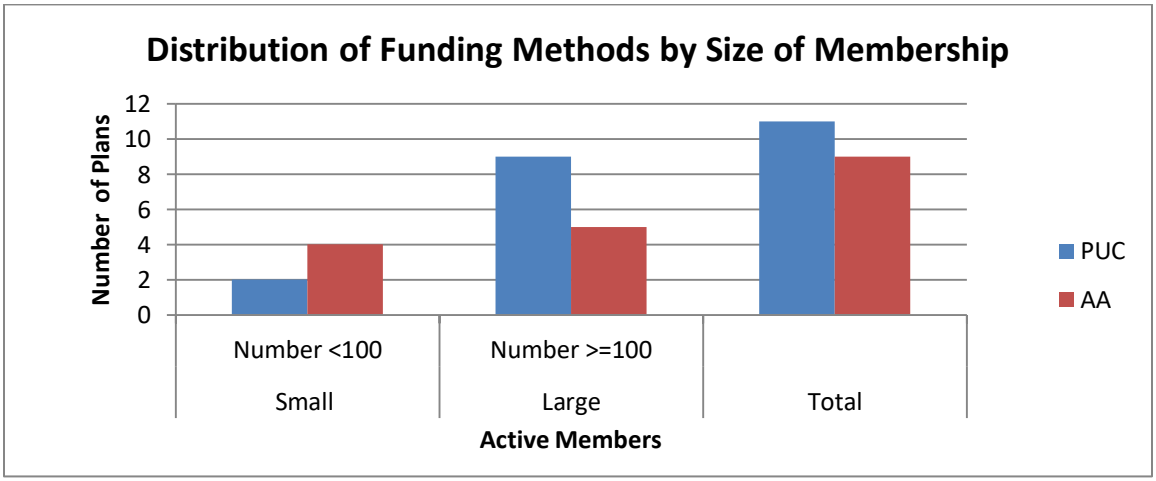
The two funding methodologies used by the actuaries in the survey are:

1. **Projected Unit Credit (PUC) Method:** this methodology calculates the accrued liabilities with the inclusion of an allowance for the effect of future salary increases on accrued pensionable service and accrued benefits. The normal cost is then the present value of benefits earned by active members for an additional year of service. The contribution to the fund is the service cost plus an adjustment to correct any discrepancies between the accumulated assets and accrued liabilities.[3]

2. **Attained Age (AA) Method:** The future normal funding rate under this methodology is calculated by dividing the present value of all future benefits accruing by the present value of future salaries. After which the normal cost is found by applying this funding rate to the current payroll of the plan members. The computation does not consider accrued benefits and so another calculation is required to compare the accrued liability with the accumulated value of the fund assets.[3]

Graph 1 shows the distribution of funding method for all plans surveyed and by size of membership. Overall, the distribution of approaches used is approximately even. However, the ratio of PUC to AA usage changes significantly when analysed by size with the ratios for small to large plans being 1:2 and 1.8:1 respectively.

A check of the funding objective against the funding methodology revealed that there may be inconsistencies between the funding objective stated and the funding method used.



Graph 1: The Distribution of Funding Methods by Size of Membership

[3] https://www.actuaries.org/CTTEES_INSREG/Documents/Edinburgh_item11d.pdf

Section 4: Economic Assumptions - Discount and Inflation Rates

Discount rates are the rates used to calculate the liabilities or present value of the future benefits of a pension plan. They estimate how much the pension plan's assets are expected to yield over the long term. A variety of methods may be used to derive the discount rates, including building block methods that separate anticipated investment returns into components and cash-flow methods that directly take into account the anticipated pattern of future benefit payments. However, actuaries usually base their rate on two indicators: the yield on long term government bonds and the estimated expected rate of returns from the pension plan's asset portfolio[4].

Selecting an appropriate discount rate is critical, as inappropriate rates can grossly underestimate or overestimate the liabilities of the plan and the contribution sponsors must pay to fund obligations. Low discount rates or decreases make a pension plan more expensive. They increase the present value of liabilities which indicates that the plan needs to hold or acquire more assets which in turn causes the contribution rate of the plan to increase. If the assumed rates are overly optimistic (too high), the costs of the plan will be understated and in the long-term, there might not be enough assets to provide for the benefits of the plan.

An analysis of the discount rate assumptions used by the 20 DB plans showed nominal discount rates ranging from 8.0% to 9.0%, with the average being 8.43%. The yield on 35 year Government of Jamaica bonds on December 31, 2016 and 2017 were 12.12% and 9.98% respectively. The pension plans surveyed invest in a diverse pool instruments (equities, real estate and governments bonds) and therefore expect to yield higher long-term returns than government instruments.

It is important that the technique and level of judgement used to set the discount rate assumption be consistent with the perspective used to derive other economic assumptions, in particular, the inflation rate. Inflation is a quantitative measure of the rate at which the average price level of a basket of selected goods and services in an economy increases over a period of time. It can be seen as the general increase in prices throughout the economy. The best estimate inflation assumptions should take into account not only the current inflation rate but also the expected long-term rates.

From our survey, 15 out of the 20 plans explicitly stated the inflation assumption; with assumptions falling in the range of 6% to 7%, at or slightly above the medium-term inflation target for Jamaica of 4% - 6%.[5] The table below shows the point to point annual inflation rates since 2017 as published by the Bank of Jamaica[6].

[4] https://www.soa.org/globalassets/assets/files/edu/edu-2009-fall-ea-assess-sn.pdf
[5] http://www.boj.org.jm/monetary_policy/setting_inflation_target.php
[6] http://www.boj.org.jm/uploads/pdf/inflation_report/inflation_report_dec2019.pdf and http://www.boj.org.jm/uploads/pdf/inflation_report/inflation_report_dec2017.pdf

Point to Point Annual Inflation Rates	
Calendar Year	***(%)***
2017	5.20
2018	2.44
2019	6.22

Table 1: The Point to Point Annual Inflation for years 2017-2019

Section 5: Mortality Assumption

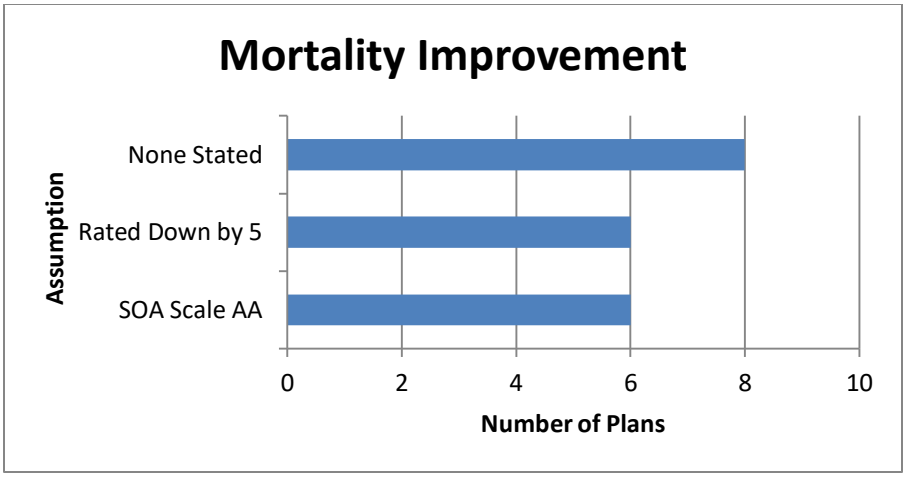
One of the most important assumptions to be made when assessing the financial health of a pension plan and its ability to meet future obligations is the mortality rate assumption. A mortality rate is defined as a measure of the frequency of the occurrence of death in a specific population during a designated interval.[7] Mortality rates vary by factors such as age, gender, occupation and membership status (e.g. active, pensioner). When setting the assumption, the actuary must consider the significance of each of the factors, the plan's experience, and the credibility of the data available.[8] The actuary will typically use a standard mortality table, published by a reputable agency such as Society of Actuaries, Institute and Faculty of Actuaries, that is relevant to the circumstances, and that has been appropriately adjusted to reflect the experience of the plan. If a plan is large and its data credible, the actuary may consider developing a mortality table for the plan. From the survey, the actuaries all chose to base the mortality assumptions on standard tables. The mortality assumptions fall within three categories:

1. *Pre-Retirement/In-service* – for active members;
2. *Post-Retirement/Out-of-service* – for deferred and current pensioners;
3. *Mortality Improvement* is the quantitative measure of the change in mortality rates when compared with previous rates. Mortality rates are expected to improve over time.

Pre-Retirement mortality assumptions varied considerably across the 20 AVRs. In eight (8) reports no deaths were assumed and in five (5), specimen tables were provided. For the remaining seven (7) plans, a standard mortality table was used - the A1967-70 Mortality Table for Assured Lives for one (1), and the 1994 Group Annuity Mortality Table (GAM94) for six (6).

GAM94 was used as the base table in all plan valuations to model post-retirement mortality. An explicit allowance for mortality improvement was made in six (6) AVRs. The SOA's Scale AA was applied. For six (6) plans, age was rated down by five years (for example: for a person aged 60, the mortality rate for a 55 year old will be used) to adjust, according to the actuary, for experience and mortality improvement. There was no explicit mortality improvement assumed in eight (8) reports.

[7] https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html
[8] https://www.soa.org/globalassets/assets/files/edu/edu-2009-fall-ea-assess-sn.pdf



Graph 2: Mortality Improvement Distribution by Plans

Section 6: In-Service Termination Rates other than Mortality

In-service termination rates are the rates members leave the plan as a result of termination of employment, ill-health or retirement (early, normal or late). Termination rates may differ by age, service, gender, occupation and industry of the covered group. The design of the plan may also affect experience. The actuary depending on the significance of a termination benefit and experience may use several decrement assumptions or incorporate them into one table. For small plans, tables produced by actuarial, government or statistical bodies may be used. Experience studies may be undertaken when the plan data is large and statistically credible.

- Withdrawal Rates – 13 or 65% used a withdrawal decrement table. Four (4) of the six (6) small plans assumed no withdrawals;
- Ill health Retirement – 25% used an ill-health retirement decrement table;
- Early Retirement – 3 made explicit provision for early retirement by loading the normal retirement provision (NRP), providing a range for the normal retirement age, or by providing an allowance for individuals depending on years of service.
- Late Retirement – All members were assumed to retire at normal retirement age and as such no decrement was assumed.

Section 7: Salary Increases

Marilyn Oliver, FSA, in her article, Assessment and Selection of Actuarial assumptions for Measuring Pension Obligations stated that "Salary increase rate is the pay increase assumption used to project the future pay levels of each current active plan participant."[9] The assumptions related to salary increase are productivity wage increase and merit/longevity increase. As the name suggests, productivity wage increases are due to productivity improvements (e.g. from new systems) while merit and longevity increases are as a result of an employee's good work ethics, higher education and/or the length of time a worker is at the company.

[9] https://www.soa.org/globalassets/assets/files/edu/edu-2009-fall-ea-assess-sn.pdf

All AVRs in the survey incorporated a salary increase assumption. The salary increase assumptions were stated in terms of either nominal and/or real (nominal values adjusted for inflation) values. The average nominal salary increase assumption was 7.23% which is greater than the medium-term inflation target for Jamaica of 4% - 6%. Real salary increase assumptions ranged from 0% to 1.5%.

Section 8: Pension Increase

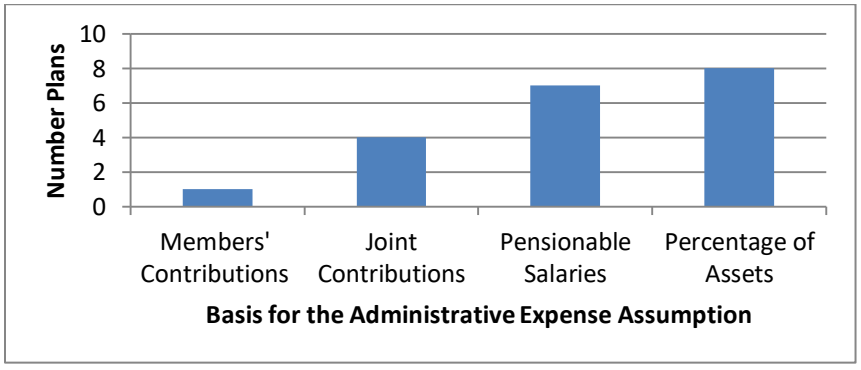
The Pensions (Superannuation Funds and Retirement Schemes) Act and concomitant regulations do not require pension plans to guarantee a level of pension increases to preserve purchasing power. Trustees are usually given the discretion to augment benefits with or without the permission of the sponsor in the plan's constitutive documents.

Future pension increases were assumed for only three (3) of the 20 plans surveyed. For the other plans, pension increases are discretionary.

Section 9: Expense Assumption

If the level of administrative expenses paid from the plan assets is material, then it is appropriate to establish an administrative expense assumption. These expenses do not include benefit payments or lump sums paid to plan participants and their beneficiaries. The expenses to be included are investment advisory, investment management, insurance advisory, accounting, auditing, actuarial, plan administration, legal, and trustee services.

The actuary's choice for the expense assumption should be in line with the experience and expectations of the particular plan and the nature of the expenses. The assumption may be specified as a dollar amount or a percentage of plan assets, pensionable salaries, benefit obligation or normal cost/contributions, or some combination of these. In the case of investment expenses, the assumption may be specified as a reduction in the investment return assumption[10].



Graph 3: A Graph showing the Distribution of Basis for the Administrative Expense Assumption

[10] http://www.actuarialstandardsboard.org/asops/asop-35-selection-demographic-noneconomic-assumptions-measuring-pension-obligations-revision/#361-administrative-expenses-charged-to-the-plan

From the graph above, it can be seen that the most frequently used assumption for administrative expense was as a percentage of assets, accounting for 40% of the plans surveyed. There exists no evidence of a direct correlation between the plan and the basis for the administrative expense assumption. The basis appears to depend on the actuary conducting the valuation. If all the administrative expense assumptions were expressed as a percentage of total assets, expenses were assumed to fall between 0.1% and 1.5% of assets.

Section 10: Margins for Adverse Deviation

The CAA actuarial standards require actuaries to consider the extent it is appropriate to adjust assumptions with margins for adverse deviation. Margins are incorporated in the work of an actuary to make allowance for uncertainty in the data, assumptions or methodology. Margins may be implicit (included in the assumption) or explicit (disclosed separately from the best estimate assumption). From the survey, it appears that all assumptions have implicit margins.

Section 11: Conclusion

Setting assumptions that are appropriate and for the valuation of the liabilities of a pension plan is a complex process in which actuaries must use their knowledge and judgement. The CAA provides actuarial standards and guidance that their members undertaking work in the Jamaica must adhere. For the valuation of DB pension plans, these include APS0: General Actuarial Practice and APS1: Pension Schemes – Actuarial Valuation Reports. The study of the economic and demographic assumptions used in actuarial valuation reports between 2016 and 2017, revealed the following range of practice. The main findings are set out in the table below:

Assumption	Findings
Funding Methodology	Two funding methods were used in the valuations in the survey; the Projected United Credit and Attained Age Methods. Overall, the distribution of approaches used is approximately even. However, the ratio of PUC to AA usage changes significantly when analysed by size with the ratios for small to large plans being 1:2 and 1.8:1, respectively.
Economic Assumptions – Discount Rates and Inflation Rates	Nominal discount rates for the 20 plans ranged from 8.0% to 9.0%, with the average being 8.43%. Nominal rates are lower than the yields on 35 year Government of Jamaica bonds which were 12.12% and 9.98% as at December 31, 2016 and 2017 respectively. 15 plans explicitly stated the inflation assumption; with the assumptions falling between 6% and 7% - at or slightly above the medium-term inflation target for Jamaica of 4% - 6%.

Assumption	Findings
Mortality	Pre-Retirement mortality assumptions varied considerably. Eight (8) assumed no deaths, five (5) provided specimen tables, one (1) was based on the A1967-70 Mortality Table for Assured Lives, and the rest on 1994 Group Annuity Mortality Table (GAM94). GAM94 was the base table used to model post-retirement mortality. The SOA mortality improvement Scale AA was used in six (6) valuations. For six (6) plans, age was rated down by five years (for example: for a person aged 60, the mortality rate for a 55 year old will be used) to adjust for experience and mortality improvement. There was no explicit mortality improvement assumption in eight (8) reports.
In Service Termination Rates other than Mortality	Withdrawal Rates – 13 or 65% used a withdrawal decrement table. Four (4) of the six (6) small plans assumed no withdrawals. Ill health Retirement – 25% used an ill-health retirement decrement table Early Retirement – 3 made explicit provision for early retirement by loading the normal retirement provision (NRP), providing a range for the normal retirement age, or by providing an allowance for individuals depending on years of service. Late Retirement – All members were assumed to retire at normal retirement age and as such no decrement was assumed.
Salary Increase	All the actuaries had a salary increase assumption; with the average being 7.23%. Real salary increase assumptions ranged from 0% to 1.5%.
Pension Increase	Future pension increases were assumed for only three (3) of the 20 plans surveyed. For the other plans, pension increases are discretionary.
Expense	All the actuaries had an expense assumption. The four methodologies used to account for expenses were expressed as a percentage of (a) the member's contributions, (b) joint contributions, (c) pensionable salaries; and (d) assets. If the assumptions were expressed as a percentage of total assets, expenses were assumed to be between 0.1% and 1.5% of assets.
Margins for Adverse Deviation	Margins for adverse deviations were incorporated implicitly.

Appendix 1: Provisions of APS0 and APS1 that relate to Assumptions

APS0: General Actuarial Practise

2.7 Assumptions and Methodology Set by actuary – Where the actuary sets the assumptions and methodology, or the principal or another party sets an assumption or methodology that the actuary is willing to support:

2.7.1. Selection of Assumptions and Methodology - The actuary should select the assumptions and methodology that are appropriate for the work. The actuary should consider the needs of the intended users and the purpose of the actuarial services. In selecting assumptions and methodology, the actuary should consider the circumstances of the entity and the assignment, as well as relevant industry and professional practices. The actuary should consider to what extent it is appropriate to adjust assumptions or methodology to compensate for known deficiencies in the available data.

2.7.2. Appropriateness of Assumptions - The actuary should consider the appropriateness of the assumptions underlying each component of the methodology used. Assumptions generally involve significant professional judgment as to the appropriateness of the methodology used and the parameters underlying the application of such methodology. Assumptions may (if permitted in the circumstances) be implicit or explicit and may involve interpreting past data or projecting future trends. The actuary should consider to what extent it is appropriate to use assumptions that have a known significant bias to underestimation or overestimation of the result.

2.7.3. Margins for Adverse Deviations - In cases where unbiased calculations are not required, the actuary should consider to what extent it is appropriate to adjust the assumptions or methodology with margins for adverse deviations in order to allow for uncertainty in the underlying data, assumptions, or methodology. The actuary should disclose any incorporation of conservatism or margins for adverse deviations in assumptions or methodology.

2.7.4. Discontinuities - The actuary should consider the effect of any discontinuities in experience on assumptions or methodology. Discontinuities could result from:

a. Internal circumstances regarding the entity such as changes in an insurer's claims processing or changes in the mix of business; or

b. External circumstances impacting the entity such as changes in the legal, economic, legislative, regulatory, supervisory, demographic, technological, and social environments.

2.7.5. Individual Assumptions and Aggregate Assumptions - The actuary should assess whether an assumption set is reasonable in the aggregate. While assumptions might be justifiable individually, it is possible that prudence or optimism in multiple assumptions will result in an aggregate assumption set that is no longer valid. If not valid, the actuary should make appropriate adjustments to achieve a reasonable assumption set and final result.

2.7.6. Internal Consistency of Assumptions - The actuary should determine if the assumptions used for different components of the work are materially consistent, and that any significant interdependencies are modelled appropriately. The actuary should disclose any material inconsistency in the report.

2.7.7. Alternative Assumptions and Sensitivity Testing - The actuary should consider and address the sensitivity of the methodology to the effect of variations in key assumptions, when appropriate. In determining whether sensitivity has been appropriately addressed, the actuary should take into account the purpose of the actuarial services and whether the results of the sensitivity tests reflect a reasonable range of variation in the key assumptions, consistent with that purpose. If practical, useful and appropriate, the actuary should report on the results, financial impact and other implications of any sensitivity testing.

APS1: Pension Schemes – Actuarial Valuation Reports

3.5 Valuation Assumptions and Methods

3.5.1. The report should contain a summary of the demographic and economic assumptions made, explicitly or implicitly, including what allowance has been made for future expenses, in valuing both the liabilities and the assets. A statement should be made as to the extent to which there have been changes to the assumptions used since the previous report. The report should include a statement of opinion by the Actuary on the prudence and appropriateness of the assumptions used.

3.5.2. The attention of the client should be directed to those assumptions to which the valuation results are particularly sensitive, such as discount rates and future rates of mortality. The Actuary should describe or illustrate how the results of 3.6 and 3.8 below will differ if the assumptions are not borne out so that the client may understand the sensitivity of the results to the assumptions chosen. Various approaches to illustrating sensitivity are possible, depending on the circumstances of the scheme. In some circumstances, it will be appropriate to identify events that may give rise to significant additional funding.

3.5.3. The report should explain the method employed in deriving the contribution rates in paragraph 3.8.1 below. Where appropriate, the report should state whether and in what way future entrants have been taken into account in the valuation. A note should be made of any changes in the method set out in the previous report.

3.5.4. The description of the funding method in 3.5.3 above, when taken with the assumptions summarised in 3.5.1, should be sufficiently detailed so that it would not result in another Actuary producing valuation results which the original Actuary considers to be materially different from the results in the report.

3.5.5. If the scheme has a statement of investment policy then the Actuary should state whether, in his opinion, it is appropriate or not. In particular, the Actuary should comment on any notable or particular risks in the investment strategy of a scheme relative to the nature and expected future incidence of the liabilities. Where relevant attention should be drawn to such aspects as concentration of assets, levels of self-investment and mismatching. The Actuary is not required to give investment advice.

Appendix 2: Pension Plan Data

Assumption		Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6
Funding Method		Projected Unit Credit	Projected Unit Credit	Projected Unit Credit	Projected Unit Credit	Aggregate Attained Age Mathod	Projected Unit Credit
Discount Rate	Real	1.5%	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated
	Nominal	8.0%	8.0%	8.0%	8.0%	8.0%	8.5%
Inflation		6.5% *	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated
Mortality (Pre-Retirement)		1994 Group Annuity Mortality Tables projected to the Measurement date, using scale AA	1994 Group Annuity Mortality Tables projected to the Measurement date, using scale AA	1994 Group Annuity Mortality Tables projected to the Measurement date, using scale AA	1994 Group Annuity Mortality Tables projected to the Measurement date, using scale AA	1994 Group Annuity Mortality Tables projected to the Measurement date, using scale AA	1994 Group Annuity Mortality Tables projected to the Measurement date, using scale AA
Mortality (Post Retirement)							
Mortality Improvement							
Withdrawal Rates		Specimen table provided	No Decrement Assumed	No Decrement Assumed	No Decrement Assumed	Specimen table provided	Specimen tables provided
Ill Health Retirement		Early and ill health loaded into NRP by 10% provision				No Decrement Assumed	
Early Retirement			Members were assumed to retire as follows: NRA 65 years - age 62 years, NRA 60 years - age 58 years				No Decrement Assumed
Late Retirement		No Decrement Assumed	No Decrement Assumed				
Salary Increase	Real	0.0%	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated
	Nominal	6.5%	7.0%	6.0%	6.5%	7.0%	7.0%
Pension Increases		3.0%	1.5%	0.0%	0.0%	0.0%	0.0%
Expenses (Admin)		15% Joint Contributions	5% Joint Contributions	5% Joint Contributions	20% of Members Contribution	7.5% Joint Contributions	1.5% Pensionable Salaries
*provided by actuary							

Assumption		Plan 7	Plan 8	Plan 9	Plan 10	Plan 11	Plan 12
Funding Method		Attained Age Method	Projected Unit Method	Projected Unit Method	Projected Unit Method	Projected Unit Method	Attained Age Method
Discount Rate	Real	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Nominal	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Inflation		6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Mortality (Pre-Retirement)		Specimen table provided	Specimen table provided	Specimen table provided	Specimen table provided	Specimen table provided	A67/70 for males A67/70 for females - rated down four years
Mortality (Post Retirement)		GAM 94 rated down by 5 years	GAM 94 rated down by 5 years	GAM 94 rated down by 5 years	GAM 94 rated down by 5 years	GAM 94 rated down by 5 years	GAM 94 rated down by 5 years
Mortality Improvement							
Withdrawal Rates		Specimen tables provided	Specimen table provided	Specimen table provided	Specimen tables provided	Specimen tables provided	Specimen tables provided
Ill Health Retirement			No Decrement Assumed	No Decrement Assumed			
Early Retirement		No Decrement Assumed			No Decrement Assumed	No Decrement Assumed	Allowance was made for members to retire on full pension prior to NRA on completion of 40 years
Late Retirement							No Decrement Assumed
Salary Increase	Real	1.0%	1.0%	0.0%	1.0%	0.5%	0.0%
	Nominal	7.0%	7.0%	6.0%	7.0%	6.5%	6.0%
Pension Increases		0.0%	0.0%	0.0%	0.0%	0.0%	3.0%*
Expenses (Admin)		1.1% of Member's Pensionable Salaries	1.9% of Pensionable Earnings	1.2% of Member's Pensionable Earnings	2% of Member's Pensionable Earnings	1.6% of Member's Pensionable Earnings	0.6% of Member's Pensionable Earnings
*Pension increases were allowed for pensioners and deferred pensioners who retired before 30/09/15							

Assumption		Plan 13	Plan 14	Plan 15	Plan 16	Plan 17	Plan 18	Plan 19	Plan 20
Funding Method		Attained Age Mathod	Attained Age Mathod	Attained Age Mathod	Projected Unit Credit Method	Projected Unit Credit Method	Attained Age Mathod	Attained Age Mathod	Attained Age Mathod
Discount Rate	Real	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Nominal	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Inflation		7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Mortality (Pre-Retirement)		none	none	none	none	none	none	none	none
Mortality (Post Retirement)		GAM94	GAM 94	GAM 94	GAM 94	GAM 94	GAM 94	GAM 94	GAM 94
Mortality Improvement		none	none	none	none	none	none	none	none
Withdrawal Rates		No Decrement Assumed	Specimen table provided	No Decrement Assumed	Specimen table provided	Specimen table provided	No Decrement Assumed	No Decrement Assumed	Specimen table provided
Ill Health Retirement			No Decrement Assumed		No Decrement Assumed	No Decrement Assumed			No Decrement Assumed
Early Retirement									
Late Retirement									
Salary Increase	Real	1.0%	1.0%	1.0%	1.5%	1.5%	1.0%	1.0%	1.0%
	Nominal	8.0%	8.0%	8.0%	8.5%	8.5%	8.0%	8.0%	8.0%
Pension Increases		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Expenses (Admin)		1% of Assets in the Fund	1.5% of Assets in the Fund	1% of Assets in the Fund	1% of Assets in the Fund	1% of Assets in the Fund	1% of Assets in the Fund	1% of Assets in the Fund	1% of Assets in the Fund
*provided by actuary									

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