**INSTITUTE AND FACULTY OF ACTUARIES**

**AUDIT TRAIL**

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**CA2: Model Documentation, Analysis and Reporting**

**Paper 1**

**Audit trail for Baby Days childcare provider**

**Objective**

Baby Days is a childcare service, which currently has 10 children per day under the age of 5. Baby Days receives income from charges it makes for providing childcare and incurs certain expenses.

The Government currently has a scheme to support parents by ensuring childcare providers offer 15 hours of free childcare per week for children aged 3 years and over. The Government are intending to extend this free childcare to 30 hours per week.

The spreadsheet:

* projects the income and expenses to determine the net income over the next two years under the 15 free hour's scenario;
* calculates the total discounted net income over the two year period;
* determines the increased fees for each age group under the 30-hour free scenario in order that the owners of Baby Days receives the same present value of income over the two year period; and
* considers an additional scenario whereby the original fees are maintained and a charge is introduced for activities that the children partake in.

**Data**

Baby Days has provided the following data:

* the profile of the children in their childcare as at 1 January 2019;
* the average number of diapers used per day by age group;
* the fees charged per child per day;
* the costs incurred to provide food and diapers to the children; and
* the number of employees and current hourly pay rates.

Statistical data has been obtained from the local bank's website:

* interest of 2% p.a.
* inflation rate of 1.5% p.a.

**Assumptions**

* No new children join Baby Days to replace those who have reached 5 years old.
* Children will only leave Baby Days as a result of attaining age 5 – no children will leave Baby Days as a result of relocation of parents/carers.
* No external government funding will be provided to Baby Days to compensate for the lost income for children aged 3 years and older.
* There are no cheaper alternative sources for food or diapers.
* Average number of diapers used per day is representative of the daily usage.
* Cost per diaper to Baby Days is not dependent on the age of the child.
* The increase in daily fees will not result in parents/carers moving their children to another childcare provider.
* Inflation rate is representative for both diaper costs and salary costs over the next two years.
* It is reasonable that Baby Days will not incur any additional costs from providing the activities.
* Demand for the activities will be in line with expectations irrespective of the activity fee.
* No other costs should be taken into account e.g. rent, heating costs, substitute employees to cover periods of sickness.

**Parameters**

*This worksheet provides a list of all parameters to support the calculations. Parameters are split into income and expense items.*

**Ages of children & diapers used**

*The purpose of this worksheet is to determine the age of the children for each month of the two-year projection period and the number of diapers used each month based on the parameters*

**Age of children each month**

Columns A to F determine the age of children with age 0 in column B and age 4 in column F.

The first row of formulae is fixed as the age of that column.

For each month (rows 4 to 27) the age is determined as follows:

* if the projection month is June then add one year to the age of the child in the previous month; otherwise
* take the previous month's age.

**Number of children in each age group**

Columns H to M determine the number of children in each age group based on the ages calculated in the previous table.

The first row of data (January 2019) is set equal to the initial number of children per age group based on the data (linked from the ‘Parameters’ worksheet).

In the following months, the calculation is:

* If the age for the month is the same as the age for the previous month, then the number of children is unchanged from the previous month; otherwise
* for columns J to M, the number of children looks up the number of children in the previous month in the previous column.
* whereas for column I (i.e. age 0), if the age has increased then the number of children is set to zero.

**Number of diapers used per month**

Column N calculates the number of diapers used each month, this is calculated as the sumproduct of the number of children in each age group and the number of diapers used per day from the ‘Parameters’ worksheet. This is then multiplied by number of days per week and the number of weeks per month.

This is calculated for all projection months.

**Total number of children**

Column O also shows the total number of children each month by summing the number of children in each age group.

A check has been included in column P to ensure that the total number of children does not increase. To complete this an IF statement has been used based on the total number of children in the previous month compared to the total number of children in the current month.

**Projection\_15 hours**

*This worksheet is used to project the net income for 2 years based on the initial scenario of the prices charged per day before the 15 free hours and adjusting the income as appropriate.*

Cell B1 contains the daily fee charged for under 3 year olds, this is taken directly from the ‘Parameters’ worksheet.

Cell B2 calculates the number of chargeable hours per week for children aged 3 years and over – this is calculated as number of hours per day (from ‘Parameters’ worksheet) multiplied by number of days per week (from ‘Parameters’ worksheet) less the number of free hours (from ‘Parameters’ worksheet).

Cell B3 contains the daily fee charged for children aged 3 years and over after adjusting for the free hours – this is calculated as fee chargeable before 15 free hours multiplied by number of chargeable hours divided by total hours per week (i.e. hours per day \* days per week).

Rows 5 to 29 contain the projection for each month over next 2 years.

Column A contains the Month/year of projection

Column B contains the year of projection

Column C contains the month of projection

Column D contains the inflation rate – Starting inflation rate is set to 1 in cell D6. Then if the month of the projection is month 4 (i.e. April) the inflation rate is calculated as the previous inflation rate \* (1+inflation rate) is taken, otherwise the previous inflation rate is taken.

Column E calculates the number of children under 3 years old – this is calculated as the sum of columns I to K (number of children aged 0 to 2 years) of the 'Ages of children & diapers used' worksheet.

Column F calculates the number of children aged 3 years and over – this is calculated as the sum of columns L and M (number of children aged 3 or 4 years) of the 'Ages of children & diapers used' worksheet.

A check is then included in Column G to check that the sum of column E and column F equals the total number of children for that month in the ‘Ages of children & diapers used’ worksheet.

Column H calculates the income per month excluding diapers = ((daily fee for under 3 year olds (cell B1) \* number of children under 3) + (daily fee for 3 year olds and over after free hours (cell B3) \* number of children 3 and over)) \* number of days per month (from ‘Parameters’ worksheet)

Column I calculates the charge for diapers used = number of diapers used per month (from column N of 'Ages of children & diapers used' worksheet) \* charge per diaper (from ‘Parameters’ worksheet).

Column J calculates the cost of diapers – this is calculated as price per pack of diapers/number of diapers per pack (from ‘Parameters’ worksheet) \* inflation rate (column D) \* column N of 'Ages of children & diapers used' worksheet (number of diapers used per month). As this is a cost, these are shown as negative values.

Column K calculates the cost of food – calculated as cost of food per week \* number of weeks per month (both from ‘Parameters’ worksheet). As this is a cost, these are shown as negative values.

Column L calculates the employee costs – calculated as number of days per month \* number of hours per day \* payment per hour \* number of employees \* inflation rate. As this is a cost, these are shown as negative values.

Column M calculates the net cashflow as the sum of columns H to L i.e. income less outgo.

Column N calculates the discounted net cashflow i.e.

DCF(t) = M(t)\*(1+i)^(t-1)

Where DCF(t) = discounted net cashflow at time t

M(t) = column M at time t

i = monthly discount rate (from ‘Parameters’ worksheet)

A check is included in column O to ensure that the discounted net cashflow is less than the net cashflow.

A further automatic check is included in columns Q and R. This checks that the impact of discounting is greater at each month compared to the previous month using an IF statement.

Cell Q31 calculates the expected impact of discounting for 2 years. This is compared to the impact of discounting in row 29. A small difference will be expected as the cashflows in a month occur at different points in time in the month. An automatic check has been included in Q32 to ensure that the difference is no more than a tolerance level of 1%.

The Present Value of net income over the two year period (cell N2) is calculated as the sum of column N.

**Projection\_30 hours**

*This worksheet is used to calculate the prices that should be charged under the scenario where 30 free hours are available for children 3 year olds and over.*

This worksheet is a copy of ‘Projection\_15 hours’ worksheet, with the following adjustments:

The formula for the price for under 3 year olds (cell B1) is changed so it is linked to the new price for over 3 year olds before free hours deduction (cell B4) multiplied by the ratio of the original pricing from the parameters worksheet (i.e. 53/50).

Number of chargeable hours (cell B2) is now linked to the 30 free hours from the ‘Parameters’ worksheet.

Cell B3 still calculates the daily fee for children aged three years and over but now based on the lower number of chargeable hours per week.

The unadjusted price for children aged over 3 year olds before free hours (cell B4) is calculated using a goalseek, whereby set the PV net income (cell M2) equal to the PV from the 'Projection\_15 hours' worksheet.

Instructions on how to run the goal seek is included in cells O2 to S4. The target PV is pulled through from the ‘Projection\_15 hours’ worksheet into cell M3 for a useful reference. A check is also included in M4 to determine if the goal seek has been run correctly or if it needs rerun.

All other calculations within the ‘Projections\_30 hours’ worksheet are the same.

**Reasonableness checks completed:**

* Chargeable price for children aged 3 years and over is lower due to the increase in the proportion of free hours
* Overall costs for under 3 year olds has increased to compensate for the lost earnings from children aged 3 years and over.

# **Additional activities**

*This worksheet is used to incorporate the income from chargeable activities and to determine the level of activity fees*

A copy of the 'Projection\_15 hours' worksheet is taken with the following adjustments:

Cell B2 (chargeable hours) subtracts the 30 free hours from the ‘Parameters’ worksheet

Cell I1 contains the base activity fee, which is calculated using goalseek to set the PV of the net income to match the original from the 'Projection\_15 hours' worksheet

Cell I2 contains the number of activities completed per month, which is number of activities per week \* number of weeks per month (both from the ‘Parameters’ worksheet).

Column E has been split into two columns (splitting out under 1 year olds and 2 year olds into two columns) – this has shifted all other columns across one

Column H’s formula has been adapted to pick up the sum of column E and F for the number of children under 3 years old

A new column has been added in column J. This calculates the revenue received from offering the activities. This is calculated as the sumproduct of the number of children split by age (column E to G) and the activity fee multiple split by age (from ‘Parameters’ worksheet) multiplied by the number of activities undertaken each week (I2) multiplied by the base activity fee (I1).

This amount is the included in the cashflow at the beginning of the month (column N).

Once these amendments had been made, the goal seek could be completed to produce the result in cell I1.

# **Charts**

*This worksheet contains the charts from the calculations i.e comparison of net income and comparison of the fees charged under each scenario*

Rows 2-26 contain the projections per month of net income under the 15 hours free and 30 hours free scenarios. A line chart is drawn from the column O from the 'Projection\_15 hours' and 'Projection\_30 hours' worksheets.

**Reasonableness checks:**

* Net income higher in earlier months due to the weighting towards children under 3 and the higher price charged for the 30 free hours scenario
* For later months, net income with 30 hours free is lower due to age of children being older and mostly greater than 3 years old so getting the lower income payment
* In both scenarios, income decreases over time as children leave childcare and not replaced.
* Step changes at June months when children age and switch price structure as they reach the age of 3

Rows 31 to 34 contain the prices chargeable per day for each age group under each of the three scenarios, which is then set out in a block chart.

**Reasonableness checks:**

* Price charged per day is highest for under 1 year olds in scenario 3 due to the increased activity charge and the activity multiplier is 3 for under 1 year olds
* Overall cost for 3 years and over is very similar under the activity scenario as per the original scenario, so the cost is partially covered by the under 3's