

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **AUDIT TRAIL**

September 2017

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

#### **Paper 1**

## Audit trail

The following audit trail should be read alongside the provided model.

### Purpose of the model

The purpose of this model is to produce the following:

- Projection of the business' monthly cashflows and its bank account balance over a 12 month period; and the determination of:
  - Grace's tax bill (i.e. salary plus profit taxes) for the year.
- A second scenario where the salary drawn by Grace is varied until the business bank account balance at the end of the year just meets the total tax bill.
- A third scenario where the salary drawn by Grace is varied until the accumulated value of the income minus expenditure cashflows for the business for the year are equal to zero i.e. zero profit tax is due.

### “Parameters” worksheet

*This worksheet includes all the data and information provided by our client, Grace.*

Parameters have been set up for the annual rent and the number of units of food items that are expected to be sold.

The two additional scenarios require annual salary that Grace takes from the business to be varied so this has also been set up as a parameter (cell C6).

The range B12 to E23 contains the percentage of units sold each calendar month, starting in January. Columns B and C contain the percentage of units sold for bread and cakes, which is fixed at 25% per month.

Columns D and E contain the percentage of units sold for sandwiches and pies each month. (A step change in the demand for products is being made to simplify the calculations required.) Pies make up 40% of the units sold in January, and we are told that this falls uniformly to the middle of the year. So, for February to May inclusive, the percentage for pies reduces by 6% each month (in absolute terms). It is then assumed that 10% are sold in the month of June, and also for the month of July. The percentage then uniformly increases by 6% each month to 40% by December. The percentage for sandwiches sold is 100% less the percentage of the other three products sold. The four cells highlighted in this range contain values; all other cells contain formulae.

Below this table is the sale price and the production cost for each unit of the four foods.

Parameters have also been set up for the salary and profit taxes, the interest rate levied by the bank when the account is overdrawn or in credit and the monthly overdraft fee charged by the bank when the account is overdrawn.

## **“Revenue” worksheet**

*This worksheet sets out the projected monthly income and production cost during the year for the four types of food.*

### *Assumptions*

- The prices for pies and sandwiches are not affected by the seasonal changes in demand.
- The only expense incurred (and to be allowed for in this model) is the production cost.

Column A sets out each of the months during the year (January through to December).

Columns B to I set out the projected number of units sold and corresponding revenue for the four types of food. Columns J and K sum the numbers for each month.

### *Self test*

The sum of the number of units sold should be  $1000 \times 12 \text{ months} = 12,000$ . This is checked in cells J18 and J19.

The revenue for each type of food is calculated as the number of units sold in total per month (fixed at 1,000) multiplied by the percentage of units sold for that month (links to the table in the “Parameters” worksheet).

### *Reasonableness check*

As expected, the number of units is 250 per month for bread and cakes, whereas the number of units sold for pies falls for the first half of the year, then increases uniformly in the second half of the year.

### *Reasonableness check*

There is a symmetry in the revenue received each month which starts at its highest in January when more of the most expensive item (pies) is sold. The total revenue then falls to the month of June, is the same in July, and then increases to the end of the year. The revenue for December is the same as the revenue for January, as expected.

Columns M to P set out the projected cost of producing each type of food. This is calculated as:

$$\text{Number of units sold that month} \times \text{Production cost per unit}$$

where the Production cost refers to the table in the “Parameters” worksheet. Column Q sums the production cost for each month.

## **“Scenario One” worksheet**

*This worksheet projects the bank account balance each month, the present value of the cashflows, and the estimated tax bill for Grace.*

### *Assumptions*

- Inflation is ignored for the year.
- Production costs are incurred and paid at the start of each month, whereas revenue is assumed to be banked at the end of the month.
- Grace will draw her salary at the end of each month.
- The I-E calculations take into account the businesses cashflows only. They do not include any interest incurred/earned on the bank account during the year, nor any overdraft fees.
- Cashflows are assumed to occur on average half way through the month for the accumulated “I-E” calculations needed for the profit tax calculations.

Column C sets out the projected monthly income, i.e. the revenue received each month. This links to the calculations of the revenue in the “Revenue” worksheet.

Columns E to G set out all the expenditure for the company. As these figures are expenditures, these columns contain negative numbers. Column E has the production cost, linking to the cost calculated in the “Revenue” worksheet.

Column F has the rental cost. This is -\$5,000 per annum, but as this is paid quarterly in advance, this is -\$1,250 and is paid in each of January, April, July and October. The MOD function is used to determine whether the month is a month that the rent is paid, or not.

Column G sets out the monthly salary taken by Grace and refers to the parameter set up in the “Parameters” sheet. This has a value of -\$1,000 for this scenario.

Columns I to O set out the projection of Grace’s business bank account.

Column I sets out the cashflow expected at the start of the month. The rent and production costs are paid at the start of the month. The values in column I are then used in column J which shows the balance of the bank account at the start of each month. This is highlighted for January as it is different from the rest of the column because there is no balance to bring forward from the previous month. For the rest of the months/column, the formula refers to column O (the bank balance at the end of the month) but refers to the row above where the balance for the previous month can be found.

If the balance at the start of the month (column J) is negative, an interest rate of 5% per annum is used; if it is positive, an interest rate of 3% per annum is used. The interest rate is shown in column K.

Column L calculates the interest incurred/earned using the interest rate determined in column K. Interest is allowed for one month on the bank balance at the start of the month (from column J).

Columns M calculates the overdraft fee payable. If the balance at the start of the month is negative, a fee of -\$100 (referring to a parameter in the Parameter sheet) is shown.

Column N sets out the cashflow expected at the end of the month. This is the revenue received during the month, plus the (negative) salary drawn, plus the (negative) overdraft fee.

Column O calculates the balance at the end of the month, by taking the balance at the start of the month (column J), adding the interest incurred/earned (column L) and adding the cashflow at the end of the month (column N).

*Reasonableness check:*

The bank balance is negative at the start as the rent is paid before any revenue is received. With revenue greater than the production cost and salary drawn, the bank balance increases for the next two months. The following month, when the rent is paid again, the balance falls, but then increases again for the next two months. This pattern repeats throughout the year.

Columns R, S and T include the calculations to be able to determine the profit tax bill. Column R shows the net “Income less Expenditure” figure for each month and is the sum of the values in columns C to G inclusive.

Column S calculates the factor to roll the value of the “Income less Expenditure” figure to the end of the year. The interest rate used is the one stipulated by the RC and is set up in the “Parameters” sheet, and each row allows for the period to the end of the year, assuming that the net ‘I-E’ figure occurs mid-month.

Column T rolls the numbers in column R up to the end of the year by multiplying the number in column S. The total of these numbers is calculated in row 17.

Under the table of projections, Grace’s total tax bill and total net bank fees are calculated.

The total salary drawn by Grace during the year is in cell G21 and is the sum of the salaries drawn each month in column G. The salary tax rate refers to cell D30 in the “Parameters” worksheet and is multiplied by the annual salary drawn in cell G21 to determine the salary tax expected for the year.

Row 22 includes the profit tax calculation. Cell G22 refers to cell T17 which is the end of year total value of the “Income less Expenditure” numbers. The profit tax rate refers to cell D31 in the “Parameters” sheet and is multiplied by the total accumulated I-E in cell G22 to determine the profit tax expected for the year.

Cell I23 is the total tax bill expected and includes the salary tax and profit tax expected.

## **“Scenario Two” worksheet**

*This worksheet is based on the “Scenario One” worksheet but uses goal seek to determine the salary drawn that results in the bank balance at the end of the year just meeting the expected total tax bill.*

### *Assumptions*

- The salary drawn by Grace is a level amount each month and does not vary.

A copy of the “Scenario One” worksheet was made and named “Scenario Two”.

The first change made was to show the bank balance at the end of the year in cell I25.

For the goal seek, cell I27 was set equal to the difference between the bank balance in cell I25 and the total tax bill in cell I23. A check cell was introduced in cell J27 which will highlight if the goal seek needs to be re-run.

Cell I29 includes the monthly salary parameter that Grace will draw, and it is this cell that the salary in column G of the projections now refers to. These cells are highlighted in yellow to indicate that the formula has changed.

Using goal seek, the salary in cell I29 is varied until the difference in cell I27 is close to zero.

### *Reasonableness check*

Setting the value in cell I29 to \$1,000 produces the same bank account balance and tax bill as for Scenario One.

### *Reasonableness check*

The monthly salary for this scenario is lower than for Scenario One, which we would expect, would result in the bank account balance at the end of the year being higher, as observed.

### *Reasonableness check*

The total net bank charges for this scenario are lower than for Scenario One. This is expected as the salary and therefore total expenditure is lower each month, reducing the need to use the overdraft facility.

### **“Scenario Three” worksheet**

*This worksheet is based on the “Scenario One” worksheet but uses goal seek to determine the salary drawn that results in a zero value of the total accumulated I-E at the end of the year.*

#### *Assumptions*

- The salary drawn by Grace is a level amount each month and does not vary.

A copy of the “Scenario One” worksheet was made and named “Scenario Three”.

The salary to be used in the goal seek calculation was set up as a parameter in cell T19. It is this cell that the salary in column G of the projections refers to. These cells are highlighted in yellow to indicate that the formula has changed.

Using goal seek, the salary in cell T19 is varied until the end of year value of the “Income less Expenditure” numbers in cell T17 is zero. A check cell was introduced in cell T21 which will highlight if the goal seek needs to be re-run.

Cell I25 shows whether Grace’s projected tax bill will be lower as she suspects. This compares the value in cell I23 (the total tax bill) with the value of the same cell in the “Scenario One” worksheet. In this case, the tax bill is lower and this cell states that.

#### *Reasonableness check*

Setting the value in cell T19 to \$1,000 produces the same bank account balance and tax bill as for Scenario One.

#### *Reasonableness check*

The monthly salary for this scenario is higher than for Scenario One, which we would expect, would result in the bank account balance at the end of the year being lower, as observed.

#### *Reasonableness check*

The total net bank charges for this scenario are higher than for Scenario One. This is expected as the salary and therefore total expenditure is higher each month, increasing the need to use the overdraft facility, which results in higher charges.

## **“Charts” worksheet**

*This worksheet produces a chart of the projected bank account balances under all three scenarios, a chart of Grace’s tax bill under all three scenarios and a chart of the total net bank charges under all three scenarios.*

Cells B4 to D16 brings in the bank account balances for each month for each of the three scenarios – column B is for Scenario One, column C for Scenario Two, column D for Scenario Three.

To the right of this table, a line chart has been produced, showing how the bank balance changes over the year for each scenario.

Cells B26 to D27 brings in the salary and profit taxes for each of the three scenarios – column B is for Scenario One, column C for Scenario Two, column D for Scenario Three.

To the right of this table, a stacked bar chart has been produced which shows the total tax due under each scenario, split between salary and profit tax.

Cells B43 to D45 brings in the net interest and total fees for each of the three scenarios – column B is for Scenario One, column C for Scenario Two, column D for Scenario Three.

To the right of this table, a stacked bar chart has been produced which shows the total bank charges due under each scenario, split between net interest and overdraft fees.

**END OF AUDIT TRAIL**