MODELLING GOLDEN RULES

These golden rules for model development bring important benefits:

+ The **ease of use** and **flexibility** of the model are increased;
+ The **risk of error** is minimised;
+ Model results are **more reliable** for **decision-making**

1. Logical structure

The model content should be distributed sensibly over worksheets. **Inputs, calculations and outputs** should be **separated** as far as possible. **Data** should clearly flow in one direction: input sheets feed the calculation sheets which produce results for the output sheets. This logic should be followed for all units depicted in the model such as business areas, business locations or legal entities.

I recommend a **cockpit** sheet towards the front of the model in order to

(i) facilitate **control** of the model: essential inputs, assumptions and switches (e.g. for scenarios) can be grouped together here and easily reviewed or amended;

(ii) enable efficient **evaluation** of results: tables and graphs clearly show the effects of key inputs and scenarios.

2. Consistent design

Consistency is key for model construction.

(i) **Columns**: Column A is usually reserved for labels. Column B can be used for totals or constants (period-independent data). Period-specific data such as sales per year start in column C. Once defined, these column usages should be consistent used on all sheets e.g. so that links remain correct if a cross-sheet formula is copied to the right.

(ii) **Rows:** The rule here is "one row, one formula", i.e. all formulas in a row should be the same, copied from left to right. If necessary, switches or flags should be used to enable this.

Once a calculation has been developed and tested for one business area (e.g. sales calculation), this can be copied and used for other business areas: this is extremely efficient for both the model developer and also for the user: if he has understood one calculation logic, he has understood them all!

(iii) **Sheets:** Similar to copied rows, sheets can also be copied, e.g. integrated financial statements for one group company can be copied for other group companies. This approach offers similar advantages to consistent columns and rows (see above), but on a larger scale.

3. Simple calculations

The principle of **'keep it simple'** is highly recommended for formulas. This reduces the **risk of errors** and increases the **transparency** of calculations.

- Rule of thumb: the length of a formula in the “command line” should ideally not exceed the length of your thumb and in any case be no longer than a single line; if necessary, split the calculation across multiple Excel rows and always label rows clearly
- Avoid macros for calculations: they hide calculations and are usually unnecessary, since Excel provides numerous functions

- Avoid so-called volatile functions like INDIRECT and OFFSET: they can be error-prone and make models difficult to understand
- Avoid circular references: they make models more difficult to understand and sometimes also to operate; unwanted, incorrect circular references may go unnoticed

4. Built-in checks

Model checks are essential. They cannot identify all model errors, but do increase **planning reliability**.

The **most important check** consists in assessing whether the balance sheet balances, i.e. total assets = total liabilities in every model period and for each unit depicted in the model (e.g. group company). Further checks should be added to the model where possible e.g. closing balance in the cashflow equals the value in the balance sheet.

Because it would be very inefficient to manually review all the checks distributed throughout a model, a **master checks sheet** is highly recommended where all check results are collected and summarised. The overall result here - “Checks OK” or “Checks indicate error” - should be shown on all model sheets (e.g. in a cell, top left); Thus a check error can be recognised immediately, no matter where you are in the model.

5. Tested content

Errors e.g. in logic cannot always be identified by built-in checks. Such mistakes are best avoided e.g. using golden rules 1 to 3 or detected and resolved via testing during model development. In testing, the focus should be on key inputs and outputs. Finally the complete model should be tested by another suitable person who was not involved in the model development.

- Do results appear plausible based upon the key inputs and assumptions?
- What happens if a key input or assumption is changed? E.g. if turnover increases, do profit and cash balances increase accordingly?
- If results change significantly over time, are the drivers of such changes clear and reasonable?

I hope this introduction to **Modelling Golden Rules** helps you in your model development.

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