

MODEL TAXATION AND REPAIR

Document 1 — Purpose, Structure and Model Logic

1. Purpose of the model

Domain: Consumer products

The model aims to study the influence of an **increase or decrease in Purchasing Power** and in the **Repair VAT rate** on:

- **Repairs;**
- **Entry into use**, including **New purchase** and **Repair compensation**;
- the stocks of **Products in use** and **Old repairable products**;
- **VAT revenues:**
 - New product VAT;
 - Repair VAT;
 - Total VAT revenue.

The model is studied over a **12-month fiscal year**, with a time step of **1 month**.

2. Model stocks

The model contains four main stocks.

Manufacturer

Manufacturer represents the source from which products enter the system.

It allows the model to measure, in absolute value, the renewal associated with new products entering the system.

Products in use

Products in use represents products that are:

- purchased new and put into service;
- or returned to service after repair.

Old repairable products

Old repairable products represents products that have been purchased and subsequently become defective and can enter the repair process or be removed from the system.

Waste

Waste represents the final output of products from the system.

The model concerns consumer products in general; therefore, the term **Waste** is used without restricting it to a particular type of product.

3. Model flows

The model contains the following flows:

- **Entry into use**
- **End of useful life**
- **End of life**
- **Disposal**
- **Repair**

3.1 Entry into use

The **Entry into use** flow contains two successive actions.

Action 1 — New purchase

This action represents the entry of new products from the **Manufacturer** into **Products in use**.

It is initialized from:

Historical new product renewal flow = 100 per month

Action 2 — Repair compensation

This action takes into account the variation in repairs compared with the historical repair flow.

It is calculated from:

Historical repair flow – Repair

An increase in repairs therefore causes a decrease in the entry corresponding to new product renewal, and conversely.

The two actions therefore constitute a single flow:

Entry into use

3.2 End of useful life

The **End of useful life** flow transfers products from **Products in use** to **Old repairable products**.

It is based on:

Historical end of useful life flow = 10 per month

3.3 End of life

The **End of life** flow transfers products directly from **Products in use** to **Waste**.

It is based on:

Historical end of life flow = 5 per month

3.4 Disposal

The **Disposal** flow transfers products from **Old repairable products** to **Waste**.

It is based on:

Historical disposal flow = 2 per month

3.5 Repair

The **Repair** flow transfers products from **Old repairable products** to **Products in use**.

It is based on:

Historical repair flow = 5 per month

and is multiplied by the combined influence of Purchasing Power and Repair VAT.

The relationship is:

Repair = Historical repair flow $\times$ Repair influence

with:

Repair influence = Repair VAT impact factor $\times$ Purchasing power impact factor

The repair flow is not limited by a $\text{Min}()$ function based on the **Old repairable products** stock.

4. Historical flows

The main flows of the model are based on historical values initialized month by month.

These values constitute the reference operating levels of the system:

Historical flow	Monthly value
Historical new product renewal flow	100
Historical end of life flow	5
Historical end of useful life flow	10
Historical repair flow	5
Historical disposal flow	2

The scenario influences are applied to these historical reference flows.

5. Initial stock values

The initial allocation of all stocks is:

0

This makes it possible to directly observe the values generated by the flows during the period studied.

6. Model dependencies

The model studies two main influencing parameters:

- **Purchasing Power**
- **Repair VAT**

The economic reasoning is:

If the Repair VAT rate increases, repairs decrease.

If the Repair VAT rate decreases, repairs increase.

If Purchasing Power increases, repairs decrease.

If Purchasing Power decreases, repairs increase.

A variation in repairs compared with the historical repair flow causes an **inverse variation in new product renewal** through the **Repair compensation** action.

7. Influence factors

Two vectors are used to represent the three possible states of each parameter.

Purchasing Power

State	Factor
PP increases	0.5
PP reference	1
PP decreases	1.5

Repair VAT

State	Factor
VAT increases	0.5
VAT reference	1
VAT decreases	1.5

The two vectors are combined to create the different model scenarios.

The two three-state vectors theoretically produce:

$3 \times 3 = 9$ combinations

8. Combined influence factors

The combined vector is:

Combined influence factors

Each domain combines one Purchasing Power state with one Repair VAT state.

The possible combinations are:

- **PP increases, VAT increases**
 - **PP increases, VAT reference**
 - **PP increases, VAT decreases**
 - **PP reference, VAT increases**
 - **PP reference, VAT reference**
 - **PP reference, VAT decreases**
 - **PP decreases, VAT increases**
 - **PP decreases, VAT reference**
 - **PP decreases, VAT decreases**
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9. Domains not retained for the analysis

Of the nine theoretical combinations, **three domains are not treated in the final analysis**, because their influence on the results studied is redundant with that of the other domains.

The three domains not retained are:

- **PP increases, VAT reference**
- **PP increases, VAT decreases**
- **PP reference, VAT decreases**

The analysis therefore focuses on the three representative domains:

- **PP increases, VAT increases**
- **PP reference, VAT reference**
- **PP decreases, VAT decreases**

The **PP reference / VAT reference** domain is used as the reference scenario for the variation indicators.

10. Tax parameters

The model uses the following prices:

New product price = 500

Repair price = 100

The VAT rate applied to new products is:

New product VAT rate = 20%

The Repair VAT rate depends on the **Repair VAT impact factor**.

The relationship used in the model is:

$$\text{Repair VAT rate} = (2 - \text{Repair VAT impact factor}) \times 10$$

This gives:

State	Factor	Repair VAT rate
VAT increases	0.5	15%
VAT reference	1	10%
VAT decreases	1.5	5%

11. Economic values

The value of new purchases is calculated from the **Entry into use** flow:

$$\text{New purchase value} = \text{Entry into use} \times \text{New product price}$$

The value of repairs is:

$$\text{Repair value} = \text{Repair} \times \text{Repair price}$$

12. VAT calculation

VAT on new products is calculated from the value of new purchases:

$$\text{New product VAT} = \text{New purchase value} \times \text{New product VAT rate} / 100$$

VAT on repairs is calculated from the value of repairs:

$$\text{Repair VAT} = \text{Repair value} \times \text{Repair VAT rate} / 100$$

Total VAT is then:

$$\text{VAT} = \text{New product VAT} + \text{Repair VAT}$$

The **Tax reserve** tracks the total tax revenue generated by the model.

13. Study period

The model uses a time step of:

1 month

A complete fiscal year consists of:

12 months

The model therefore uses:

nbt = 12

The three variation indicators are calculated at the end of month 12.

14. Variation indicators

Three indicators are used to directly compare the scenarios:

- **Repair variation**
- **Manufacturer variation**
- **Total VAT revenue variation**

The **PP reference / VAT reference** domain is the comparison baseline.

The general formula is:

$$\text{Variation (\%)} = ((\text{Scenario value} - \text{Reference value}) / \text{Reference value}) \times 100$$

For **Manufacturer** and **Tax reserve**, the absolute value is used in the comparison because these stocks are represented with negative values in the model.

The variations therefore measure the relative difference between each scenario and the reference scenario at the end of the **12-month fiscal year**.

15. Overall model logic

The overall logic can be summarized as follows:

Historical flows

↓

Purchasing Power and Repair VAT influence

↓

Repair

↓

Repair compensation within Entry into use

↓

Products in use

↓

End of useful life / End of life

↓

Old repairable products / Waste

In parallel:

Entry into use + Repair

↓

Economic values

↓

New product VAT + Repair VAT

↓

Total VAT revenue

The resulting values are then compared with the:

PP reference / VAT reference

scenario.

16. Main purpose of the analysis

The model is designed to highlight the relationships between changes in **Purchasing Power** and **Repair VAT** and their consequences for:

Repairs → Entry into use → Stocks → VAT revenues

The three final summary indicators are:

Repair variation

Manufacturer variation

Total VAT revenue variation

They provide a direct measurement of the relative impact of the different scenarios compared with the reference situation.