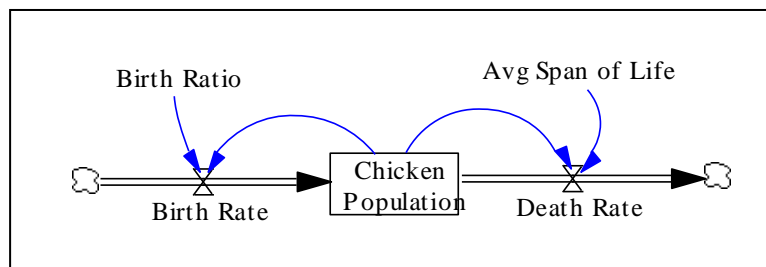

Model Formation

A. Installation

1. Go to www.vensim.com
2. Download Vensim PLE for academic purposes into your 'D:\\vensim' drive

B. Getting Started (Chicken's Life)

1. Choose New Model
2. Set Initial/Final Time, Time Step (should be smaller than the minimum time in the model variables; normally 0.125), Time Unit.
3. Draw the following causal loop diagram



4. Make equations for variables

Equation List

Avg Span of Life= 20
Unit: Month

Birth Rate= Chicken Population*Birth Ratio
Unit: Chicken/Month

Birth Ratio=0.1
Unit: Dmnl/Month

Chicken Population= INTEG (Birth Rate-Death Rate,1000)
Unit: Chicken

Death Rate=Chicken Population/Avg Span of Life
Unit: Chicken/Month

FINAL TIME = 100

- ~ Month
- ~ The final time for the simulation.

INITIAL TIME = 0

- ~ Month
- ~ The initial time for the simulation.

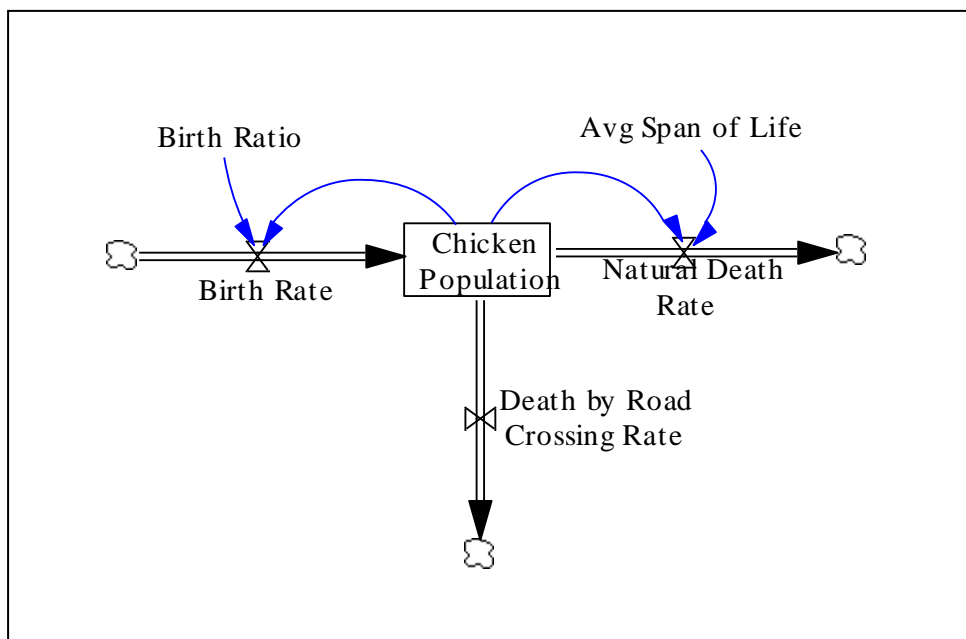
TIME STEP = 0.125

- ~ Month
- ~ The time step for the simulation.

5. Unit Check: go to Model and Units Check
6. Model Check: go to Model and Check Model
7. Give a run name (xxx.vdf)
8. Simulate
9. Analyze
10. Apply different scenario and see results (Birth Ratio: 0.1 -> 0.05, 0.75, 0.15; Life Span: 20 -> 15, 10, 25)
11. Save the model (xxx.mdl)

C. Variation of Chicken's Life Model

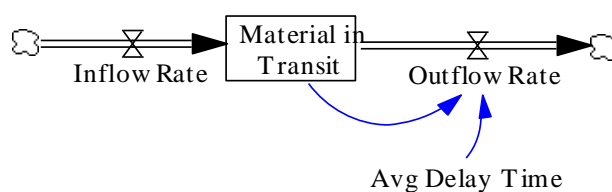
1. Further classify reasons for the decrease of the number of chicken into 1) Natural Death Rate and 2) Death by Road Crossing Rate (3% of the current chicken will pass away during the exodus)



2. Simulate it
3. Analyze changes in the number of chicken adapting the base case with different scenarios (3% -> 5%, 7%, 2%)

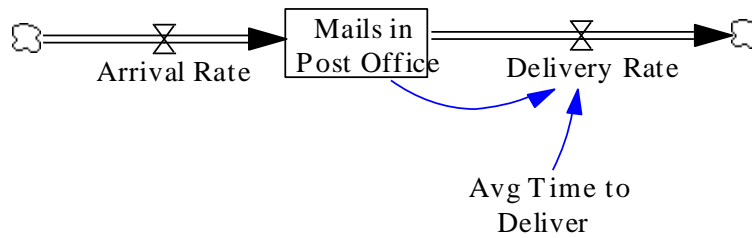
D. Material Delay and Information Delay

1. Material delay

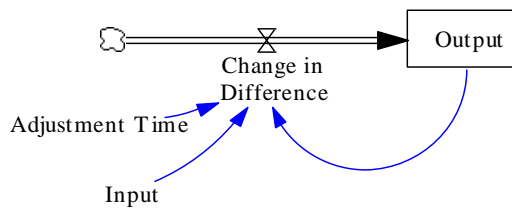


$$\text{Outflow} = \text{Material in Transit} / \text{Avg Delay Time}$$

Example

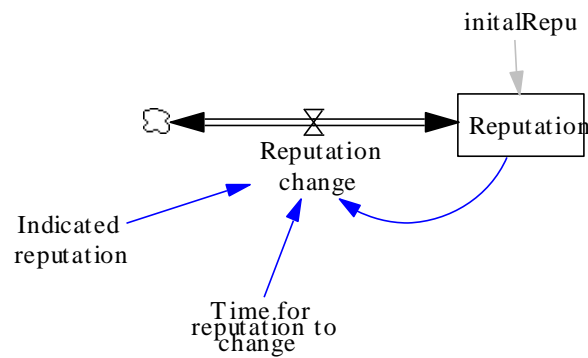


2. Information Delay (adaptive expectations, smoothing)



$$\text{Output} = \text{INTEGRAL}(\text{change in Difference}, \text{Output}(0))$$

Example1.



Example2.

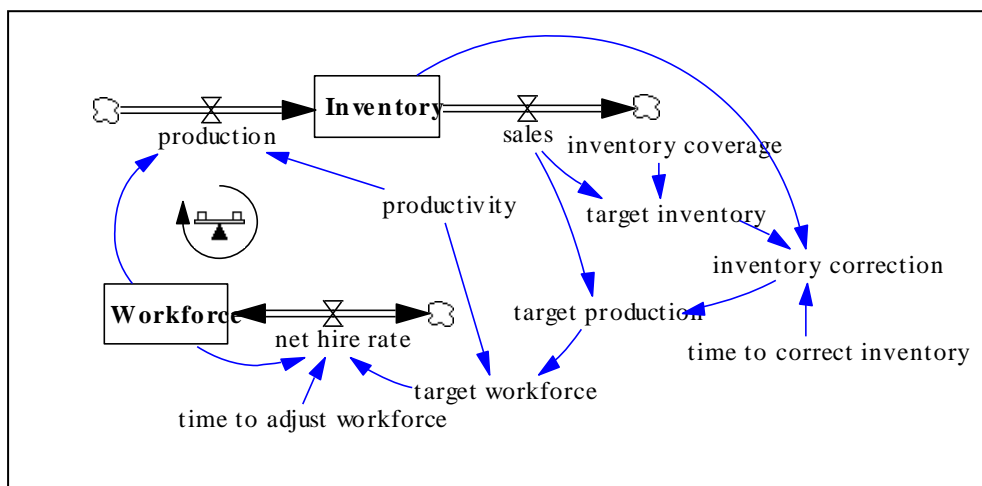
Loving each other

E. Inventory Management

1. Assume that
 - 1) the initial inventory was 300 widgets and
 - 2) target inventory level is three times of sales amount.

If sales amount is increased by 50 widgets, what will happen to the inventory level? What is the inventory level in 100th month?

2. Get the inventory model: Vensim\PREMODEL\CHAP03\WFINV.MDL
3. Analyze the inventory level with different scenarios.



FINAL TIME = 100
 ~ Month
 ~ The final time for the simulation.
 |

target inventory=
 sales * inventory coverage
 ~ Widget
 ~ |

target production = sales + inventory correction
 ~ Widget/Month

```

~          |
inventory correction = (target inventory - Inventory)/
  time to correct inventory
~      Widget/Month
~          |

inventory coverage = 3
~      Month
~          |

time to correct inventory=
  2
~      Month
~          |

INITIAL TIME = 0
~      Month
~      The initial time for the simulation.
~          |

Inventory = INTEG(production-sales,300)
~      Widget
~          |

net hire rate = (target workforce-Workforce)/time to adjust workforce
~      Person/Month
~          |

production = Workforce*productivity
~      Widget/Month
~          |

productivity = 1
~      Widget/Month/Person
~          |

sales = 100 + STEP(50,20)
~      Widget/Month
~          |

SAVEPER = 1
~      Month
~      The frequency with which output is stored.
~          |

target workforce = target production/productivity
~      Person
~          |

TIME STEP = 0.25
~      Month
~      The time step for the simulation.
~          |

time to adjust workforce=
  3
~      Month
~          |

Workforce = INTEG(net hire rate,    target workforce)
~      Person

```

