Lab 2 - Operational Thinking

**Background**

You have been losing sleep lately because the company you work for is in financial trouble. You don’t have a good picture of what would happen to your finances if your work was cut back. You sit down one day and list some of the issues that affect your personal finances:

You know that news about the general economic climate and your company’s financial health affect your feelings of anxiety. You determine that your anxiety is also related to how much you have in your savings account and the amount of money you spend every month.

Assume that:

* + your savings earn a fixed interest rate,
  + your expenses are completely fixed,
  + you are working a fixed number of hours each week,
  + and have a fixed hourly wage

Stocks: Savings

Flows: Expenses (rate of money out), rate of pay (rate of money in)

Parameters: $/hr. (fixed), hours worked (fixed), interest rate

Non-constant auxiliary variable: anxiety level

* What might the purpose of such a model be?

The purpose would be to allow for future planning based on projection models. Identify at what point your financial carrying capacity is exceeded by lack of work. Plotting one’s anxiety level into the future.

* What base unit of time makes the most sense (week, month, year)? Why? [link to brief discussion](https://d2l.pdx.edu/content/enforced/676153-OFFERING_SYSC-514-001_201801/Operational_Thinking_Lab.htm?ou=676153#time)

I would set the time increments to one month for a farther time horizon and trade of granularity. For a more granular assessment, I would select a one-week increment, as two weeks is the smallest, reliable increment of change. In this case, I will set my increments to one month.

* What are the key variables? What is "flowing" in the system? What are the units of measure for the key variables and associated flows?

The key variables are Expenses (rate of money out), Rate of Pay (rate of money in). The unit of measure for money in the US is the Dollar. Anxiety *does* ebb and flow, but it does not move from one element to another and do I do not think that it counts as a flow.

* What key elements might be considered "outside" (exogenous to) the system being modeled? How might they be represented?

General economic climate (GNP, pertinent interest rates)

* What are the critical influences or interconnections between elements those elements that have different units of measure?

GNP dollars and Interest rates percentage points are directly related

dollars (in-out = savings) and GNP dollars are directly related

anxiety units and savings are inversely related

anxiety and work hours are inversely related up to a point, after which they are directly related. For example: if you work too little, your anxiety level goes up; if you work more, your anxiety level goes down; if you work too much, your anxiety level goes back up.

Work hours and Pay dollars are directly related

Company health level and anxiety level are directly related

Annual return rate, GNP, and savings are all directly related

**Equations and parameters**

* Hourly pay, work hours per week, monthly expenses, and rate of return (as an annual percentage rate, possibly) are constants
* Monthly pay is Hourly Pay times Work Hours per Week times the number of weeks per month
  + number of weeks per month is one of those parameters that cannot change, so it can be safely embedded in the equation
* Income simply equals monthly pay
* Expense outflow simply equals montly expenses
* Provide an initial value for savings
* For the interest inflow, if you used a percentage (rather than a fraction), don't forget to divide by 100
  + you must also divide by the number of months per year (assuming month is your time unit)
* This leaves anxiety
  + think about how you will model this
    - write down your ideas

Anxiety = 1 (low) – 10 (high) scale

Anxiety is inversely related with Savings and Monthly Pay (taking into account that Monthly Pay is aggregate of GNP, Company Financial Health, Weekly Hours Worked, and Hourly Pay Rate).

A small amount of GNP is represented by the Company Financial Health and has a year delay between perceptual and actual levels corrections.

Company Financial Health is measured in Company Revenue. The more Company Revenue, the more the company is in demand and the more they can pay workers. Pay Rate and Hours worked may be, but don’t have to be correlated, so each would receive half of the output of Company Revenue.

Monthly pay is simply Hourly Rate times Weekly Hours times number of Weeks in the Month.

Savings is aggregate of Annual Return Rate (delay of 1 year), Monthly Pay and subtract Expenses.

Anxiety is directly related to Expenses. As Expenses go up, Anxiety Level goes up. The more Dollars that are in savings, the larger the amount of Expenses increase per unit of increased Anxiety Level.

((Cos(Savings / Expenses)) \* Monthly Pay)/1000 = Anxiety Level change as a ratio/Dollar change in either Savings or Expenses