

### Conjecture of ?@eq-moneyquant and ?@eq-workthermal

How consistently map economic measures to the quantities of nature to model the economical system?

Input:

$$Input = f_0(Resouces, Labor, Capital) = \text{Work} = \Delta\text{Energy} = p \cdot v \quad (1)$$

Output:

$$Output = \text{Goods} + \text{Services} = \text{Production} = \Delta\text{State} = V_I \quad (2)$$

Productivity:

$$Productivity = \frac{Output}{Input} = \frac{\Delta\text{State}}{\Delta\text{Energy}} = \frac{Production}{Work} = \frac{V_I}{pv} \quad (3)$$

see description of “movement” ?@eq-movement

Table 1: Core Measurements

<b>Economy</b>	→	←	<b>Physics</b>
Resources	Assets	Force	Matter
Capital	Liabilities	Momentum	Space
Labor	Expenses	Work	
	Income	Energy	Time
		Production	

As a first approach, considering the geometrical perspective of the concept of “work” (?@eq-workgeom), applied to economical measurements, so to satisfy the following system:

$f_A(Assets) = f_B(Liabilities + Gain) = \text{“momentum” } p$  from initial state  $r_0$  to new state  $r_1$ , where the change of state is  $r = r_1 - r_0$

Matter substance, object movement/change:

$$A = f_A = F \cdot t = p \quad (4)$$

Space of movement, maneuverability:

$$B + R = f_B = m \cdot v = p \quad (5)$$

Work input (efforts, costs) through labor force, machines and infrastructure applied, and materials consumed for production:

$$W = f_0 = F \cdot r = m \cdot \frac{v}{t} \cdot r = p \cdot v \quad (6)$$

Energy transfer, energy change, profit or loss:

$$Y = \Delta E = \frac{1}{2}pv + \mathcal{U} \quad (7)$$

Production value inflation adjusted:

$$P \cdot V_I = \sum Y_{adjust} = \sum (W + R)_{adjust} = \Delta U - \Delta H = Q \cdot N \quad (8)$$

see **?@eq-workthemoostat** and **?@eq-workgeom**

Thus, to be determined are  $v$  (economy velocity) and  $p$  (financial structure). Eventually, determine  $r$  = “state change through trajectory” (substance change to the new assets structure) by given  $v$  = “velocity of movement” (Business speed = monetary value, price with inflation), or determine  $v$  by given  $r$ . The individual positions  $\{i, j, l, m\}$  of Liabilities  $\{B_i + R_j\}_k$ , Assets  $\{A_m\}_k$ , and Expenses  $\{W_l\}_k$  shall be grouped in sets  $\{k\}$ , so to satisfy  $f_k(i, j) = f_k(m) = f_k(l) = \{pv\}_k$ .

The constraints shall be modelled with the Lagrangian. Hence, “Work” shall be derived from the Hamiltonian which leads to the identification of the “movement” (= change, transformation) of the trajectory (= path to new state) with  $\dot{r} = v$  and  $\dot{p} = F$ .

Experiment design:  **$p$  and  $v$  are modelled ex-ante with means of CONSTRAINTS from contractual agreement and from given juristic legislation, in such a way that physics laws are satisfied. Decisions making occure within this ex-ante frame.**