

System Stability vs Signal Stability

A Case Study in Money

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- We know the thermostat works precisely because **we do not notice these external changes**.

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- Capitalism gives us an example of this.

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- On the other hand the mandate of a mode of production is to create **use-values** - useful things which society needs to survive and thrive.
- Problem for capitalism: capitalists only *nominally* seeks exchange-value. Effects that their actions have on the use-values produced are *effective*, or *accidental*.

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- It's a fairly convincing story, when you first hear it.
- The problems with this story, as well as a hidden and surprising function of money, can be witnessed by looking through a completion offered by the Japanese economist Michio Morishima for Marx's reproduction schema in volume II of Capital.

Analytical Framework

- Commodities, labor and money all circulate both within and between the departments.
- Marx partitions set of all use-values into two categories:
 1. **Means of production**, or **capital goods**, are commodities to be used in production.
 2. **Consumption goods**, or **wage goods**, end-products, meant for consumption outside of the economy.
- Each commodity type is produced by a **department**, an aggregation of different firms into a single producer.
 1. Department I - capital goods
 2. Department II - wage goods
- This is a strictly *use-value* distinction.
- Primary concerns: identify contradictions, as well as social necessities implied by the assumption that the system is viable (i.e. able to reproduce itself).

Assumptions of the Model

- Perfectly elastic labor pool (unbounded industrial reserve army). <- No problems in the sphere of production or in the reproduction of social relations.
- Unchanging methods of production.
- No fixed capital, and no saving: all goods produced at the start of a ~~production period~~ year t are purchased and used during year t . No saving on the part of workers or capitalists.
- Perfect supply-demand equilibrium is maintained at all times. This created a hidden requirement:
- An equalized rate of profit across all industries. Equal money investments always receive the same return on investment, regardless of the department being invested in.

Equilibrium Rate of Profit?

- The absurdity of these equilibrium growth model is obvious and rightly criticized for many reasons. Among others, it's whole conception is circular.
 - Capitalists shift their production according to disequilibrium in supply and demand
 - How then, within equilibrium, are they able to know what to do?
- However, we must always remember the age old statistics aphorism: "*All models are wrong. Some models are useful.*"
- Bottom line is that **non-uniform profit rates, if they existed, are a factor which would influence prices and drive production decisions independently of supply and demand.** They thus undermine the story we were told which resolves the contradiction between use-value and exchange-value in Capitalism.
- If markets have any hope on delivering on the prosperity promised by market apologists, then *we should be able to observe this prosperity theoretically, within this overly perfect model.*
- Contrapositively, if we cannot, then their story was wrong.

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- By doing this Marx locked himself in to viewing only stable, balanced growth.
- If we replace this strange investment scheme with his original idea, as Morishima does in his book *Marx's Economics*, we see something completely different.

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 - The compositions of capital k_1 and k_2 . So for example if $k_2 = 4$, this means that when reinvesting in the consumer goods department, standard techniques of production dictate that the capitalist must spend 4 times as much on means of production as they do on wages.

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- The use of labor values here is strictly as an accounting technique - no assumptions made about how prices and values relate to one another.

Identities

- Obtainable from the parameters e , k_1 , and k_2 are the numbers c_1 , v_1 , s_1 , c_2 , v_2 , and s_2 . These break down a unit of value output into its constant, variable, and surplus components.
- So, for example, if the output from dept. I is $y_1(t)$, then $c_1 y_1(t)$ represents the value of the means of production which must have been invested in order to create this total value. $v_1 y_1(t)$ is the total value of the real wages paid, $s_1 y_1(t)$ is the surplus value portion, and so forth.

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Difference Equations

- In words, the system of difference equations essentially just say
 - The total value from dept. I at the beginning of time t has to be equal to the total value in means of production used by departments I and II during period t .
 - The total value from dept. II at the beginning of time t has to be equal to the total value of wages paid to workers in both departments plus the total surplus value not reinvested by capitalists
- In symbols, these two statements are:

$$y_1(t) = c_1 y_1(t + 1) + c_2 y_2(t + 1)$$

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- These equations can be solved analytically using standard techniques learned in a differential equations class. Though it is not too difficult in the current year, it is understandable why Marx would have run into mathematical difficulty with his original investment scheme!
- The system is consistent, and exactly determined as long as $k_1 \neq k_2$. Thus, there is only a *single* growth path which capitalists must follow in order to achieve their desired growth. What does it look like?

What Does Equilibrium Growth Actually Look Like?

- We see two major qualitative categories of growth, depending on how the departmental compositions of capital compare with one another. [Interactive Model](#)
- In both cases, massive disproportionalities arise between the departments. Inevitable, one department ends up liquidated.
- The reasons why the curves look like this are identical to the problems with the story the political economists told us.
- Balanced growth is achievable, but only with unrealistically specific initial conditions.

Reason 1: Resource Constraints

- Despite supply and demand being equivalent, capitalists still want something - to reinvest at a fixed rate of surplus received.
 - Without the ability to **divest** resources from existing investments, they will generally find this impossible.
 - They will find themselves lacking in one type of use-value they need, and with their desired reinvestment producing an oversupply of another.
 - This creates an incentive to continually reorganize the distribution of use-values which is *independent* of supply-demand equilibrium.
 - Note that if the department being downsized is more labor intensive, then workers laid off will find themselves unable to find new jobs in the economy.
- But wait, how could workers be going hungry if supply and demand are in equilibrium?!

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- **Conclusions:** the story we were told overlooks a perverse incentive for divestment in order to facilitate growth over all else, creating periodic crises of disproportionality *without any disruption to price signals!*

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- Transformation problem: in this model, prices will differ from values. Not enough time to go into details on this.
- Capitalist profit and surplus value will differ. Morishima reconstructs the model with capitalists reinvesting a fixed proportion of their *profit* rather than their *surplus-value*. What changes?

Nothing fundamentally changes

- Qualitatively speaking, the outcomes we witnessed before all persist.
- This shouldn't surprise us. The issue wasn't the reinvestment scheme - but rather the contradiction between use-value and exchange-value.
- However, in this more realistic model, we can see an additional signal which is stabilized within the equilibrium model.

Rate of Accumulation

- The rate of capital accumulation is defined to be the proportional increase in capital invested in the economy per period.

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- However, this definition is purposefully ambiguous. What is the unit of measurement here? Value investment? Or money investment?

Rate of Accumulation

- The rate of capital accumulation is defined to be the proportional increase in capital invested in the economy per period.

$$G(t) = \frac{\text{Change in capital investment between times } t \text{ and } t+1}{\text{Capital investment at time } t}$$

- Stability of $G(t)$ could be taken as a measure of health of the economy from the perspective of capitalists. $G(t)$ steady and unchanging \Rightarrow good times for capitalists.
- However, this definition is purposefully ambiguous. What is the unit of measurement here? Value investment? Or money investment?
- From the perspective of the system's overseer's - the capitalists, and what they are able to see, we must assume that it is measured in terms of money. However...

The Unit Matters!

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- However, since profit rates are equalized, shifting investment from one dept. to another *has no effect on profits!*. The *surplus* output changes, but the *profit* output stays the same.
- Thus, the money RoA is unchanging! We have thus found the true signal that our equilibrium model is stabilizing as a control system.

The Dazzling Money Form

- This is thus a very subtle and interesting example of a signal filtering information for the second (bad) reason - capitalists through their reliance on money-signals, perfectly blind themselves to the world of use-value!

Conclusions

- Whatever systems we design, if we want them to be stable, we will need to define metrics representing that stability. But we cannot allow ourselves to become too attached to these.
- We must free ourselves of a religious mindset with respect to the metrics we choose to pursue stabilizing. The numbers are not reality, and reality is what we are trying to keep stable! These are different!
- Systems don't have the luxury of absorbing variety through ignorance. However, the metrics we design will often steer us into thinking otherwise
- Often, this contradiction asserts itself accidentally in ways which are hard to anticipate. Marx's completed equilibrium model shows us an example of this with respect to money.
- Extreme care needs to be put into the decision of what quantities should be stabilized. Both with respect to the unit and the metric.

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- Because this is all possible uses for capital goods, because $y_1(t)$ represents all capital goods available for period t , and because of the assumed supply-demand equilibrium, we require strict equality:

$$y_1(t) = c_1y_1(t + 1) + c_2y_2(t + 1)$$

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- We thus have the dept. II equation:

$$y_2(t) = v_1y_1(t + 1) + v_2y_2(t + 1) + (1 - a)s_1y_1(t) + (1 - a)s_2y_2(t)$$