# What does it mean?

This section gives a very basic introduction to the theoretical issues involved in constructing a useful simulation. Actually, you don’t need to go any further to use the simulation or understand it. However, as you proceed, you will probably want to return to this section.

You can skip it if you wish, and move to the following section that takes you through a series of *projects* – simulations with different data, that illustrate the principles at stake, in the process offering a bit of fun.

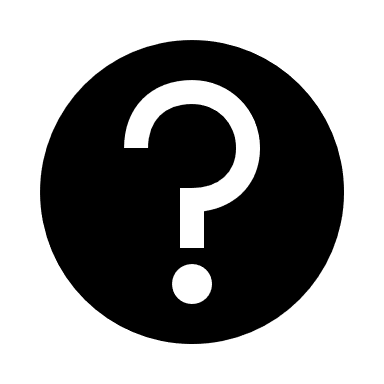
You can also read up on the theoretical documents that underpin this analysis at

## Quantity, price, and value: how to add up

A major problem in economics arises from trying to measure quantities in a meaningful way. In reality, farms don’t just produce corn but a mixture of corn, chickens, milk, and so on. It’s not always possible to add these up and speak of the ‘quantity’ of the product – sometimes this problem is termed the ‘apples and oranges’ problem.

It ishowever always possible to speak of the priceof this product, just as you can speak of the price of a meal. It’s just the sum of the prices of the items in it. It is also possible to speak of its value, a concept integral to the simulation, which provides a measure of the ‘amount of’ a product. Economists, though they don’t always admit it, apply a value concept as soon as they try to delineate production from exchange. Among a value concept’s elementary properties are that it can be aggregated, like a price, and is conserved in exchange: though individual commodities can be sold for more, or less, than their value, the total value in the economy does not vary when goods merely change owners.

Whilst it is not meaningful to speak of the aggregate quantity of a composite good, it can help to pretend this quantity is known, as long as we remember that any realistic calculation must not rely on the pretence. You can choose to display ‘NaN’ (non-applicable Number), or a ‘pretend’ quantity, using the ‘NaN’ button in the display controls.

In some cases, such as the total of inputs to production, the price, value and quantity are not displayed separately. The buttons labelled ‘quantity’, ‘price’ and ‘value’ let you switch between these expressions. In such cases, quantity is always displayed as ‘NaN’.

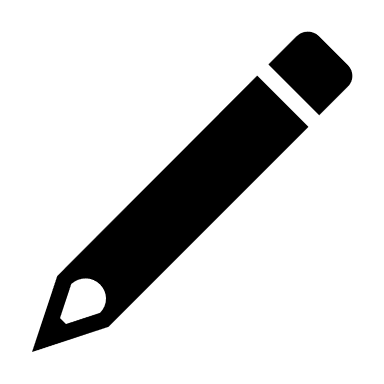
## Money

Money is the most important thing in a capitalist economy, and the worst understood by economists. Without it you can’t run a business, or even survive as a person, because you need it to buy what you consume. Furthermore, unless you account for it, you cannot hope to understand crisis. A crisis occurs when people stop buying and start creating ‘hoards’ – stocks – of money*.* They stop buying produced goods, and stop investing in production, leading to the downward spiral that is called recession. This is why an understanding of money is a basic prerequisite of any practical theory of political economy.

This doesn’t reduce to the over-simplistic idea that hoarding causes crisis: the heart always stops when somebody dies, but to theorise the cause of death, we must also know what makes hearts stop. In like manner, we need to know what makes the money crystallise into hoards at certain times and not at others. However, hoards are an element of every crisis; therefore, any theory which pretends they cannot happen is akin to a theory of death that pretends the heart can never stop.

Yet, in the equilibrium approaches which dominate political economy today, money cannot form a hoard: indeed, it’s not even needed. Keynes and Marx, who were both temporalists, vigorously attacked the idea that the economy reproduces perfectly, an idea expressed by the economist J.B. Say who wrote at the time of Ricardo. In contrast, in any consistent temporal simulation, money hoards appear very naturally: they are stocks of money.

This does not tell us where money comes from or what it is, beyond insisting that it must exist as a stock, it must be a measure of price, and owners must be able to purchase any commodity with it (in jargon language, it is a *universal equivalent)*. Instead, the App allows for a range of possible theories ranging from pure credit to the draconian thesis that money must be a produced commodity.

The can test different assumptions about money and value, and see how well these explain the world. However, it checks to see if they make sense by imposing *stock-flow consistency* (§6).

The App only asks for a definite algorithm that determines how much money is created or destroyed, to say when this happens, and to define how it affects all other stocks.

## Money flows and Exchange Consistency

When commodities are purchased, money is transferred from one owner or group of owners to another. During the ‘trade’ action, for example, workers and capitalists each buy $1500 worth of consumption goods from the consumption circuit. When they have done that, the consumption circuit has $3000 more money, but its sales inventory is $3000 smaller. Conversely, the two social classes each have $1500 less money and $1500 more in consumption goods.

There are two flows involved. Money has flowed from the social classes to the consumption circuit, and goods have flowed from the consumption circuit to the social classes. At the risk of seeming laborious, we say that the circuits have ‘sold’ their goods and the social classes have ‘bought’ these same goods. In stock-flow terms, $3000 in goods has moved from the stocks of the circuits to that of the social classes, while $3000 in money has moved in the opposite direction.

This exchange is governed by two elementary arithmetic identities. First, the money price of each *type* ofcommodity in the economy does not change. Therefore, the change in any stock, however measured, is equal to the balance of the flows into and out of that stock, measured the same way. Second, however, the total price of the stocks of *any owner* do not change. Before the exchange, each social class had $1500 in money; after, they have $1500 in goods.

This may seem blindingly obvious: yet it does not hold, for any equilibrium theory. That is to say, it does not hold for most economic theory. For, equilibrium theory tells us, prices at the end of any period are equal, not to the prices at the start of the next period, but at the start of the previous period. It follows that the economy’s goods are sold for one price – that which holds during the first period – and purchased for another, that which holds during the next. The theory, as Linda Ronstadt puts it, makes ‘money disappear, just by talking sweet and low’.

The App insists on exchange consistency – what the buyers pay, the sellers receive. It’s as simple as that.

## Price changes

A different issue arises when prices change. Since all stocks can be measured in money (it is the expression of their price), all owners of commodities are affected when prices change. If the price of silver falls from $120 an ounce to $100 an ounce, someone who owns a pound of silver will suffer a loss of $20 X16 = $320.

A change in price can therefore give rise to a money flow, even though no payment has been made.

(the illusion that a price change constitutes a payment)

## Production

Explain Productive stocks

# Pieces of text to be integrated later

## What happens when?

When you pressed the ‘one period’ button, you asked the app to simulate everything that needs to happen, in its hypothetical market economy, to get from one point in time to another. You can enquire in more detail through the various facilities provided by the simulation. Marx’s notation is particularly useful for this purpose. In line with most economic theories, Marx distinguishes *production,* during which commodities are made, from *exchange*, during which owners buy and sell these commodities in order to consume them. Some of these, which in line with common usage we term consumption goods, are consumed directly by people,

In general, value is any measure of output that can be aggregated, so that the value of six apples and five oranges is equal to six times the value of one apple, plus five times the value of one orange. Logically it can be shown that a meaningful value measure must have two further properties. It must be *conserved in exchange* (its total must not grow or shrink when goods change owners without being consumed or produced) and it must be a *function of production* (its magnitude must depend only on what is consumed in order to produce it).