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[Notes 7]
Various "minor" questions

Q What is the relationship between the $P_t C_t^j$ term in the budget constraint (third expression on page 2) and the expression I would except to be the one in the budget constraint:

$$\int_0^1 p_t(z)\, c^j(z)\, \mathrm{d}z$$

(as this is is the nominal expenditure on the continuum of goods)? Are they equivalent?

A Good question. When solving for the demand for individual goods on indeed takes as starting point nominal expenditures as written above. This is also what is shown in the Appendix A, equation (2). In Appendix B, the price index is derived, and from the first equation of Appendix B (second-to-last equation on page 20), it is stated that the price index must satisfy

$$P_t C_t^j = \int_0^1 p_t(z)\, c^j(z)\, \mathrm{d}z.$$

So, with the definition of the consumption index, and the associated price index, the two expressions are the same.

Q Until the first equation on page 6, what we have derived is demand and price of each good z. However, in the first equation on page 6, we have the two new terms $y_t(h)$ and $p_t(h)$. Is it because that, at the equilibrium, each agent (though it has a distinct commodity) sells its product at the same price and produces the same quantity?

A Yes that is the reason. All agents have same preferences and technologies, so *in equilibrium*, there is symmetry. They all sell the same amount and charge the same price.

Q How is the elasticity of substitution $(1/(1-q))$ derived?

A As demand for a given good is

$$c^j(z) = \left[\frac{p(z)}{P}\right]^{-\frac{1}{1-q}} C^j,$$

the elasticity of substitution measures how many percent demand for the good changes when its price relative to the prices of other goods (the price index) changes by a percent. We thus want to find

$$\frac{\mathrm{d}c^j(z)}{d\left[\frac{p(z)}{P}\right]} \frac{\frac{p(z)}{P}}{c^j(z)}.$$

This is readily found as

$$\begin{aligned} & -\frac{1}{1-q}\left[\frac{p(z)}{P}\right]^{-\frac{1}{1-q}-1} C^j \frac{\frac{p(z)}{P}}{c^j(z)} \\ = & -\frac{1}{1-q}\left[\frac{p(z)}{P}\right]^{-\frac{1}{1-q}} C^j \frac{1}{c^j(z)} \\ = & -\frac{1}{1-q}. \end{aligned}$$

Hence, the elasticity of substitution is $1/(1-q)$ (as one always expresses that as an absolute value).

Q What is meant by real product wage and real consumer wage (page 13)?

A The real product wage is the nominal wage relative to product prices (this is the relevant real wage for producers and thus labour demand), while the real consumer wage is the nominal wage relative to consumer prices (this is the relevant real wage for consumers, and thus suppliers of labour). A depreciation typically has a direct inflationary effect on the consumer price, and thus the idea in the model is that this could reduce labour supply relative to demand.