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The New Monetary Aggregates

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We have argued in Chapter 15 that the simple-sum method of aggregation makes strong a priori assumptions about substitution effects and the result is a set of monetary aggregates that do not accurately measure the actual quantities of the monetary products that optimizing economic agents select (in the aggregate). We also surveyed the microeconomic theory of monetary aggregation, as it has evolved during the past twenty years, using a model of the optimizing behavior of representative economic agents.

Our objective in this chapter is to develop a better understanding of the Divisia monetary aggregates, by presenting the source and the underlying microeconomic theory of the Divisia index. In addition, we provide an empirical assessment of the relative merits of the Divisia versus the simple sum method of monetary aggregation as well as other, recently proposed, aggregation procedures. Our objective is to be able to settle on a satisfactory method of ‘measuring’ money.
16.1 The Neoclassical Monetary Problem

In the discussion to this point, we have shown that in the second stage of the two-stage maximization problem, with weak separability between monetary assets and consumer goods and leisure, the consumer faces the following problem

$$\max_{x} f(x) \text{ subject to } p'x = y, \quad (16.1)$$

or, written out in full,

$$\max_{x_1, x_2, \ldots, x_n} f(x_1, x_2, \ldots, x_n)$$

subject to

$$\sum_{i=1}^{n} p_i x_i = p_1 x_1 + p_2 x_2 + \cdots + p_n x_n = y,$$

where $x = (x_1, x_2, \ldots, x_n)$ is a vector of services from monetary assets, $p = (p_1, p_2, \ldots, p_n)$ is a vector of monetary asset user costs, and $y$ is the expenditure on the services of monetary assets.

The first order conditions for a maximum can be found by forming an auxiliary function known as the Lagrangian

$$\mathcal{L} = f(x) + \lambda \left( y - \sum_{i=1}^{n} p_i x_i \right),$$

where $\lambda$ is the Lagrange multiplier. By differentiating $\mathcal{L}$ with respect to $x_i$, and using the budget constraint, we obtain the $(n+1)$ first order conditions

$$\frac{\partial f(x)}{\partial x_i} - \lambda p_i = 0, \quad i = 1, \ldots, n;$$

$$y - \sum_{i=1}^{n} p_i x_i = 0,$$

where the partial derivative $\partial f(x)/\partial x_i$ is the marginal utility of asset $i$.

What do these first order conditions tell us about the solution to the utility maximization problem? Notice that the first $n$ conditions can be written as