the class

$$p_i q_{,,} \qquad p_{,,} x_{i;} b)+u_{,,} \tag{32}$$

for commodity i on observation i, parameter vector b, and error For the linear expenditure system the function takes the form

$$x\text{‘;} \qquad r,p_{,,} + \quad - \quad 0. \tag{33}$$

2.1. Simultaneity

The first problem of application is to give a sensible interpretation to the quantity x_{1}. In loose discussion of the theory x, is taken as "income" and is assumed to be imposed on the consumer from outside. But, if g, is the vector of commodity purchases in period i, then (a) only exceptionally is any real consumer given a predetermined and inflexible limit for total commodity expenditure and (b) the only thing which expenditures add up to is total expenditure *defined* as the sum of expenditures. Clearly then, x, is in general jointly endogenous with the expenditures and ought to be treated as such, a point argued, for example, by Summers (1959), Cramer (1969) and more recently by Lluch (1973), Lluch and Williams (1974). The most straightforward solution is to instrument x, and there are no shortages of theories of the consumption function to suggest exogenous variables. However, in the spirit of demand analysis this can be formalized rather neatly using any intertemporally separable utility function. For example, loosely following Lluch, an intertemporal or extended linear expenditure system can be proposed of the form

$$PAU\text{-}\ PilYif\text{+}\ Pil(1 \qquad E\ EPT^{I'}{}_{ark)}\ vir, \tag{34}$$

rat k

where the y,, and /3, parameters are now specific to periods (needs vary over the life-cycle), W is the current present discounted value of present and future income and current financial assets, and $12,^{1}1$ is the current discounted price of good k in future period -r($= p,_{k}$ since t is the present). As with any such system based on intertemporally separable preferences, see Section 4 below, (34) can be solved for x, by summing the left-hand side over i and the result, i.e. the consumption function, used to substitute for W. Hence (34) *implies* the familiar