

Partial-Adjustment Model:

The partial-adjustment model says that the actual change is only a fraction of the desired change. Let explain this model by the following two cases study:

The first case study:

Suppose a firm anticipates some change in the demand for its product, and to do that, it has to adjust its productive capacity or say capital stock (K_t), but it can not do this immediately.

Let (K_t^*) be the desired capital stock, then ($K_t^* - K_{t-1}$) is the desired change. And ($K_t - K_{t-1}$) is the actual change.

According to the partial-adjustment model, we have;

$$K_t - K_{t-1} = \delta(K_t^* - K_{t-1}) \quad \dots\dots\dots 1$$

Where; $0 < \delta < 1$

Also suppose that the desired capital stock (K_t^*) is a function of sales (S_t), so that we have ;

$$K_t^* = \alpha + \beta S_t \quad \dots\dots\dots 2$$

Combining eq.1 and eq.2, we get;

$$K_t - K_{t-1} = \delta(\alpha + \beta S_t - K_{t-1})$$

$$\text{So,} \quad K_t = \delta\alpha + \delta\beta S_t + (1 - \delta)K_{t-1} \quad \dots\dots\dots 3$$

Eq.3 can be written as following;

$$K_t = \alpha_0 + \alpha_1 S_t + \alpha_2 K_{t-1} + u_t \quad \dots\dots\dots 4$$

Where; $\alpha_0 = \delta\alpha$, $\alpha_1 = \delta\beta$, $\alpha_2 = (1 - \delta)$

eq.4 is a regression model with lagged dependent variable as an explanatory variable. Thus we estimate a regression equation of K_t on S_t and K_{t-1} , to get $(\hat{\alpha}_0, \hat{\alpha}_1, \hat{\alpha}_2)$, and from these estimated parameters we get the estimate of the eq.3 parameters;

$$\hat{\delta} = 1 - \hat{\alpha}_2 \quad , \quad \hat{\beta} = \frac{\hat{\alpha}_1}{(1 - \hat{\alpha}_2)} \quad , \quad \hat{\alpha} = \frac{\hat{\alpha}_0}{(1 - \hat{\alpha}_2)}$$

The second case study:

Let C_t^* be the desired consumption in period t , and suppose it is proportional to income Y_t that is;

$$C_t^* = \beta Y_t \quad \dots\dots 5$$

Also let the actual change in consumption ($C_t - C_{t-1}$) be a fraction of the desire change ($C_t^* - C_{t-1}$)

That is ;

$$C_t - C_{t-1} = \delta(C_t^* - C_{t-1}) \quad \dots\dots 6$$

Combining eq.5 and eq.6, we get;

$$C_t - C_{t-1} = \delta(\beta Y_t - C_{t-1}) \quad \dots\dots 7$$

$$\text{So,} \quad C_t = \delta\beta Y_t + (1 - \delta)C_{t-1} \quad \dots\dots 8$$

Which can be written as;

$$C_t = \alpha_1 Y_t + \alpha_2 C_{t-1} + u_t \quad \dots\dots 9$$

$$\text{Where;} \quad \alpha_1 = \delta\beta \quad , \quad \alpha_2 = 1 - \delta$$

eq.9 is a regression model with lagged dependent variable as an explanatory variable. Thus we estimate a regression equation of C_t on Y_t and C_{t-1} , to get $(\hat{\alpha}_1, \hat{\alpha}_2)$, and from these estimated parameters we get the estimate of the eq.8 parameters;

$$\hat{\delta} = 1 - \hat{\alpha}_2 \quad , \quad \hat{\beta} = \frac{\hat{\alpha}_1}{(1 - \hat{\alpha}_2)}$$

It is easily seen that eq.8 is indistinguishable from eq.4 in Distributed lag models, thus when we estimate a regression equation of C_t on Y_t and C_{t-1} , we can not tell whether this is a consequence of a Partial-Adjustment Model or a Distributed lag model.