Welfare Impact of Asymmetric Price Transmission on Bangladesh Rice Consumers

The usual linear ARDL (p,q) co-integration model (Pesaran and Shin, 1999; Pesaran et al., 2001) with two time series y_tand x_t(t = 1, 2, ..., T) has the following form:

(1) ?y_t=?_0+?y_(t-1)+?x_(t-1)+?z_t+?_(j=1)^(p-1)??_j ?y_(t-j)+?_(j=0)^(q-1)??_j ?x_(t-j)+e_t

Where z_t is a vector of deterministic regressors (trends, seasonal, and other exogenous influences, with fixed lags) and e_t is an independent and identically distributed stochastic process. Under the null hypothesis (i.e., y_t and x_t are not co-integrated), the coefficients of the lagged levels of those two variables in Equation (1) are jointly zero (?=?=0). Pesaran et al., (2001) showed that the assumption of no cointegration could be tested either by means of a modified F-test, denominated as F_PSS or by means of a Wald-test, denominated as W_PSS. The test procedure relies on two critical bounds; the upper and the lower one. If the empirical value of the F_PSS, the W_PSS statistic exceeds the upper bound, the null is rejected (there is evidence of a long-run equilibrium relationship between y_t and x_t); if it lies below the lower bound, y_tand x_tare not co-integrated; if it lieswithin the critical bounds the test is indecisive.

The ARDL approach to co-integration testing has several interesting characteristics. First, it performs better to small samples compared to alternative multivariate co-integration procedures. Second, it is more efficient than the standard Engle and Granger two-step approach (typically employed in estimating asymmetric EC and TVEC models). Third, it does not require the restrictive assumption that all series are integrated of the same order allowing for the inclusion of both I (0) and I (1) (but not I (2)) time series in a long-run relationship; this not only provides substantial flexibility but also avoids potential “pre-test bias”, that means, specification of a long-run model on the basis of I (1)variables only (e.g., Pesaran et al., 2001; Romilly et al., 2001).

The combination of stochastic regressors in the standard ARDL approach is linear, implying symmetric adjustments in the long- and the short-run. To account for asymmetries Shin et al., (2014) introduced the NARDL model in which x_tis decomposed into its positive and negative partial sums, that is,

?(2) x?_t=x_0+x_t^++x_t^-

Where

?(3) x?_t^+=?_(j=1)^t???x_j^+ ?=?_(j=1)^t?max??(?x_j,0)? and x_t^-=?_(j=1)^t???x_j^- ?=?_(j=1)^t?min??(?x_j,0)?

Then, the asymmetric long-run equilibrium relationship can be expressed as:

?(4) y?_t=?^+ x_t^++?^- x_t^-+u_t

Where ?^+and ?^- are the asymmetric long-run parameters associated with positive and negative changes in x_t, respectively. Shin et al., (2014) showed that by combining (4) with the ARDL (p,q) model (1) we obtain the NARDL(p,q) model as:

(5) ?y_t=?_0+?y_(t-1)+?^+ x_(t-1)^++?^- x_(t-1)^-+?_(j=1)^(p-1)??_j ?y_(t-j)+?_(j=0)^(q-1)??(?_j^+ ?x_(t-j)^+ ?+?_j^- ?x_(t-j)^-)+e_t

Where, ?^+=-???^+ and ?^-=-???^-

The empirical implementation of an NARDL model involves four steps. The first is to estimate (5) by standard OLS. The second is to verify the existence of an asymmetric co-integrating relationship between the levels of the series y_t, x_t^+, and x_t^-. Under the approach proposed by Shin et al., (2014); the null hypothesis of no co-integration (?=?^+=?^-=0) can be tested using the F_PSS(W_PSS) statistic. The thirdis to test for long and for short-run symmetry. For long-run symmetry, the relevant nullhypothesis takes the form ?^+=?^-(i.e. ??^+??=-?^-??) and it is tested by means of a standard Wald test. For short-run symmetry, the relevant null hypothesis can take either of the following two forms, the pairwise (strong-form) symmetry requiring ?_j^+=?_j^-for allj=1,2,…,q-1or the additive (weak-form) symmetry requiring ?_(j=0)^(q-1)??_j^+ =?_(j=0)^(q-1)??_j^- . Thesehypotheses are tested by means of a standard Wald test as well. Provided that there is asymmetry (either in the long-run or in the short-run or in both), the fourth step involves the derivation of the positive and negative dynamic multipliers associated with unit changes in x_t^+ and x_t^-. These are calculated as

?(6) m?_h^+=?_(j=0)^h?(?y_(t+j))/(?x_t^+) and m_h^-=?_(j=0)^h?(?y_(t+j))/(?x_t^-)

With h=0,1,2,… for x_t^+ and x_t^-, respectively. Whereas h??, then m_h^+??^+ and m_h^-??^-. Depicting and analyzing the paths of adjustment and/or the duration of the disequilibrium following initial positive or negative perturbations in prices, m_h^+and m_h^-add useful information to the long- and short-run patterns of asymmetry.