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Do exchange rate changes improve the trade balance: An asymmetric nonlinear cointegration approach

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A B S T R A C T

This paper examines the impact of real effective exchange rate on the trade balance of eight countries in the context of several nonlinear techniques, especially the nonlinear auto-regressive distributed lag model (NARDL). The advantages of the NARDL approach vis-à-vis earlier approaches is that it provides more efficient short-run and long-run coefficient estimates and allows through the distributed lag and the long-run dynamics a single common cointegrating vector. Both parts are allowed to be asymmetric. While previous studies have relied on models that ignored the time series properties of the variable and some have used the linear ARDL and obtained mixed results, the current paper uses the nonlinear auto-regressive distributed lag model (NARDL). We show that this is due to the assumption that the relationship is symmetric in nature. Results from long-run cointegration analysis, short-run analysis and half-lives, all provide evidence indicating that when depreciation is separated from appreciation, it is shown to have significant effects on the trade balance but in an asymmetric model.

1. Introduction

Although exchange rate changes have long been a subject of interest, the focus of this interest has evolved considerably since the generalized floating era. Movements in the exchange rate have effects on imports and exports, and nominal depreciation or appreciation of the exchange rate is presumed to change the real exchange rate and, thus, have a direct effect on a country's trade balance. According to international trade theory, a real depreciation/devaluation of domestic currency would make imports more expensive and exports cheaper and ultimately leads to an improvement in the trade balance. It is expected that an improvement in a country's trade balance does not occur immediately because at the time of depreciation, previous purchase orders or contracts for import and export quantities have been agreed to; however, price changes tended to have an immediate effect.

The effects of currency depreciation or devaluation on a country's trade balance are usually examined by the Marshall-Lerner (M-L) condition of stability. This condition requires estimation of both export and import demand models. Estimating such models can be tedious and often requires using a proxy for world income, world export prices, effective exchange rates, and identifying trading partners. However, for many countries, data for constructing such variables are not readily available. Nonetheless, some studies (e.g., Arize, 1990; Warner & Kreinin, 1983; Goldstein & Khan, 1978; Houthaker & Magee, 1969) have employed this approach. The consensus is that the M-L condition is easily satisfied because the sum of demand price elasticities has been found to exceed unity, so

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devaluation will improve a country's trade balance in the long run.

Following theoretical developments in such studies as Dornbusch and Fischer (1981), rather than examining demand-price elasticities, some studies (see, for example, Himarios, 1985, 1989; Haynes & Stone, 1982; Miles, 1979) have recognized a direct connection between the trade balance and the exchange rate. Haynes and Stone (1982), who employed level data with import value divided export value (or its inverse) as a regressand, and Himarios (1985), who used exports minus imports, found evidence that devaluation improved the trade balance in the majority of their samples. Other authors such as Miles (1979) have shown no evidence of a positive and statistically significant relationship between the trade balance and the exchange rate. His finding is based on first-differenced data with trade balance scaled by income as a regressand. Nevertheless, these studies failed to pin down the nature of the exact empirical connection between the variables.

Recent contributions in the econometric literature have suggested cointegration analysis as a means of determining whether there is a long-run relationship between variables that contain unit roots. Cointegration provides a useful way of identifying a long-run structural representation from a reduced-form model. The Engle and Granger (1987) technique was the first method of examining cointegration, and many studies have relied on that technique. For instance, Bahmani-Oskooee (1991) and Arize (1994) used the Engle-Granger type cointegration technique to show that a long-run equilibrium relationship exists between the trade balance and the real effective exchange rate (REER). In addition, they found that currency depreciation/devaluation improves the trade balance in most developing economies.[2]

Other subsequent studies have since reconsidered the same issue by employing several econometric methodologies, such as using the full information maximum likelihood (FIML) estimator developed by Johansen (1988) and extended by Johansen and Juselius (1990) and the autoregressive distributed lag (ARDL) bounds testing techniques of Pesaran, Shin and Smith (2001); however, these results were also mixed. On the one hand, some studies have obtained a positive relationship between the trade balance and real effective exchange rate (see, for example, Sun & Chiu, 2010; Aziz, 2008; Ng, Har, & Tan 2008; Bahmani-Oskooee, 2001; Onafowora, 2003; Singh, 2002; and Bahmani-Oskooee & Alse, 1994), and a positive relationship implies that currency depreciation will close the trade gap.

On the other hand, some studies have failed to notice any relationship between the two variables (see, for instance, Liew, Lim & Hussain, 2000; Hatemi & Irandoust, 2005; Wilson & Tat, 2001; Rose, 1990; Bahmani-Oskooee & Malixi, 1992). Work by Liew et al. (2000) found that for the Association of the Southeast Asian Nations (ASEAN countries) – Indonesia, Malaysia, the Philippines, Singapore and Thailand - the impact of exchange rate on the trade balance is exaggerated and also that it is the real exchange rate not the nominal exchange rate that affects the trade balance. On the other hand, Bahmani-Oskooee (2001) concluded that real exchange rate does not change on its own; it is actually the nominal exchange rate that is changed first, and that change causes a shift or fluctuations in the real exchange rate.

The main objective of this study is to provide new evidence on the effects of exchange rate changes on the trade balance of Asian countries using quarterly data,1980.1 through 2013:4, from eight Asian developing countries - China, Israel, South Korea, Malaysia, Pakistan, the Philippines, Russia and Singapore. The evidence presented will add an extra dimension to this literature and determine the extent to which the previous findings may be confirmed by applying techniques suggested in this study. It may also provide the basis for future analyses of the trade balance/exchange rates nexus in other countries, such as some of the new Eastern European economies.

Knowledge of the extent to which the exchange rate can be stabilized is important for the management and design of both trade and exchange rate policies. For instance, policy actions aimed at stabilizing the domestic economic system can obtain results that are, at best, uncertain, if policymakers fail to realize the degree to which real exchange rates can be applied as a puppet to control exports and imports while tolerably maintaining the stability as well as the degree of ostentation. Moreover, if the currency depreciation leads to a loss of trust in the economic system, stabilization policies to ensure price level stability may be doomed and foreign investors may be hesitant to invest (Arize & Darrat, 1994). In addition, if currency depreciation actually leads to a reduction in exports because imported raw materials are needed to produce them, then the intended effect of trade liberalization and trade-adjustment programs that have strongly emphasized the need for export expansion could be doomed by currency depreciation and could precipitate a balance -of –payment crisis since it makes the “imported component” more expensive and unattainable for the domestic producers while raising export prices.

This paper has three aims. The first is to analyze the time series of the relevant variables over the sample period. The second is to examine the data using several nonlinear tests because, when one looks at the consequences of previous empirical investigations, the evidence is mixed, and further investigation is necessary. Further, we want to learn whether trying to model nonlinear dynamics using linear specifications might be the source of the mixed evidence. The third aim is to provide new evidence on the issue using a new, recently suggested asymmetric autoregressive distributed model by Shin, Yu and Mimmon-Greenwood (2014); no such analysis has been reported thus far in the eight countries. The fourth aim is to test for asymmetry between positive and negative exchange rate rates. As pointed out by Parsley & Wei (1993:609), “This is the key aspect, there is an asymmetry in the responses of trade flows to exchange rate; specifically, some exchange rate changes will produce different effects than others of equal magnitude.” Rahman and Serletis (2009) find that exports respond more asymmetrically to possible positive shocks to the exchange rate than to negative shocks

[2] The problem with the Engle-Granger approach is that testing of hypotheses concerning the long-run estimates cannot be conducted on the basis of the least squares standard errors concerning the long-run estimates and
has been criticized by several researchers because they do not have a limiting normal distribution, which implies that the conventional values of the t-distribution cannot be relied upon inference.

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