# Exchange Rate – Relative Price Nonlinear Cointegration Relationship in Malaysia

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## *Abstract*

The finding of exchange rate–relative price nonlinear cointegration relationship in Malaysia, among others, suggests that nonlinear Purchasing Power Parity (PPP) equilibrium may be regarded as reference point in judging the short run misalignment of the Ringgit currency and thereby deducing effective policy actions. Moreover, economists who wish to extend the simple PPP exchange rate model into the more complicated monetary exchange models may do so comfortably, at least in the text of Malaysia. Nonetheless, such attempt should be tailored in a nonlinear way to suit the nonlinear characteristic of exchange rate behaviour

# 1. Introduction

The relationship between exchange rate and relative price remains one of the most explored topics in the exchange rate literature. Documentation regarding the theoretical discussion and empirical investigation on this relationship, which may be hypothesized as Purchasing Power Parity (PPP), is voluminous. The hypothesis of PPP postulates that nominal exchange rates adjust to reflect differences in price levels across countries. By this hypothesis, the exchange rate between currencies of any two economies should equalize the relative price levels in these economies, provided that the effects of trade barrier and transaction costs are negligible. In reality, the market is not free after all and it has been generally accepted that PPP is not likely to hold true in the short run. Conversely, researchers have not settled on the debate of whether or not PPP is valid in the long run, due to the contradicting empirical evidence thus far. Interested readers are referred to, for instance, Rogoff (1996); Taylor (2002); and Sarno and Taylor (2002) for a comprehensive review on the PPP literature.

The enthusiasm in revealing long-run PPP validity in reality is unsurprising as it has various major implications in the international economics in general and policy decisions in particular. Among others, PPP long run equilibrium is a useful benchmark in the setting of exchange rate parities or in the judging of exchange rate misalignment with fundamental. Moreover, it serves as a basis in determining the international competitiveness of a country's goods and services. PPP is also an indispensable building block of monetary exchange rate models. Once PPP is found invalid, these models simply collapse and no policy suggestion would then be applicable. All in all, the failure of PPP is not just the letdown of the theory *per se* but it has disastrous practical consequences for policy-makers in essence. As such, exchange rate researchers and policy-makers are at all times fascinated by the viability of PPP.

The empirical inconclusiveness of PPP – which is renowned in the literature to an extent that it has been regarded as PPP puzzle by Rogoff (1996) – has motivated many exchange rate researchers back to the examination of the assumptions underlying the theory[1]. Recently, there is a growing consensus that the inconclusiveness of previous studies is methodological. In particular, the conventional unit root tests have been found unreliable in the testing of PPP in the presence of (i) structural break (Corbae and Ouliaris, 1990; Dropsy, 1996 and Sabaté *et al*., 2003) (ii) cross-sectional effect (Mohamed-Azali *et al*., 2001; Holmes, 2001; Chiu, 2002 and Taylor, 2002) and (iii) nonlinearities (Taylor and Peel, 2000; Sarno, 2000; Baum *et al*., 2001). The present study sought to contribute to this literature in examining the validity of PPP in the presence of nonlinearities, which may be induced either through market frictions or structural breaks in the economy. It has the advantage of testing PPP in the univariate framework without resorting to panel data, which has been criticized of assuming homogeneous cointegrating coefficients across countries in the panel procedure (Rapach and Wohar, 2003).

Through extensive review of the literature, Sarno and Taylor (2002) arrive at the main conclusions that exchange rate – relative price relation holds in the long run among major industrialized countries, and that mean reversion in real exchange rates displays significant nonlinearities. This study is interested to examine whether the same conclusion can be extended to small and open developing countries such as Malaysia. To the best of our knowledge, previous related researches that focus solely on Malaysia has been done by Gan (1991) and Goh and Mithani (2000) only. Gan (1991) finds no relationship between real effective exchange rate and relative price of tradable goods. Similar conclusion is arrived in a later study by Goh and Mithani (2000) who find that Malaysian's real exchange rate follow a random walk implying the invalidity of PPP. Others studies in a multi-countries context with the inclusion of Malaysia are also limited. Among others, Manzur and Ariff (1995) find that PPP holds poorly in the short run but quite well in the long run in Malaysia and other four selected South East Asian countries. Bahmani-Oskooee (1993) and Baharumshah and Ariff (1997) also obtain, among other countries,

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[1] See Goh and Mithani (2000) and the references therein for an overview in this respect.

a weak evidence of long-run PPP in Malaysia. Their results are in contrary to Kim (1993) who rejects the PPP hypothesis in Malaysia and Singapore using the Johansen and Juselius (1990) method. Recently, Razzaghipour *et al*. (2001) use statistical analysis to study the mean-reversion to PPP in the Asian currencies including Malaysian Ringgit and obtain empirical support for PPP, although not statistically significant. Meanwhile, Mohamed-Azali *et al*. (2001) are able to provide support for PPP between South East Asian countries (including Malaysia) and the Japan using the panel unit root and cointegration approach. One remarkable note is that all methodology adopted in these studies are in the linear framework, which is not reliable in the presence of nonlinearities (Taylor and Peel, 2000; Kapetanios *et al*., 2003; and Liew *et al*., 2003). Indeed, Liew *et al*. (2003) have shown that Malaysia and 10 other Asian real exchange rates exhibit nonlinear behaviour, using linearity test formulated by Luukkonen *et al*. (1988). As such, previous results on Malaysia, in which nonlinearities have not been considered, are no more relevant. It is interesting to know whether the PPP hypothesis receive support or not from the nonlinear perspective point of view. In light of this, the current study adopts the nonlinear unit root test put forward by Kapetanios *et al*. (2003) (henceforth denoted as KSS test). The results of this KSS test suggest that, taken into the consideration of nonlinearity in Malaysian Ringgit – U.S. Dollar (MYR/USD) real exchange rate, the corresponding nominal rate is cointegrated with relative price. It is argued that the current result overrule previous findings including Goh and Mithani (2000)[2], which adopt methodology that has been criticized of malfunctioning in the presence of nonlinearities (Taylor and Peel, 2000; Kapetanios *et al*., 2003).

## 2. Malaysian Exchange Rate Regime[3]

The currency of Malaysia is regulated by Bank Negara Malaysia (BNM), the Central Bank of Malaysia, which was established on 26 January 1959 with major goals of promoting economic growth, a high level of employment, maintaining price stability and a reasonable balance in country's international payments position, eradicating poverty and restructuring society. The Malayan Dollar (M$) was created on 12 June 1967, replacing the old Sterling-linked Malayan/Straits Dollar[4] but continually tied to Pound Sterling. On 25 June 1972, M$ was linked to U.S. Dollar (USD) with a fluctuating Effective Rate ranging from M$2.76 to M$2.88. On 13 February in the following year, this fluctuation range for M$ Effective Rate was revised as M$2.48 to M$2.60, following the USD devaluation. This Effective Rate was placed under BNM's controlled, on a floating basis on 21 June 1973. BNM set in to intervene to maintain relative stability in the value of M$ and orderly market conditions whenever the currency fluctuated excessively as compared to a basket of Malaysia's trading partners' currencies.

In the year 1975, Malaysia entered a new exchange rate regime. The Malaysian Dollar was officially renamed the Ringgit with its external value determined based on a trade-weighted basket currencies. In 1978, the exchange rates for all other currencies were determined on the basis of Ringgit – U.S. Dollar (MYR/USD) rate and the USD rates for those currencies in the foreign exchange markets. Since then, Malaysian exchange rate was managed within a band of RM2.50 to RM2.70 (Goh and Mithani, 2000). This managed float was sustainable until the mid of 1997, when Ringgit started to depreciate excessively following the outbreak of the Asian Financial Crisis. Within a year, Ringgit plunged over 37% as compared to the USD (Hasan, 2001). Effectively from 2 September 1998, the exchange rate of the Ringgit was no longer

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[2] Using ADF test, Goh and Mithani (2000) fail to reject the null of nonstationary in the CPI based and WPI based real exchange rates, implying no cointegration between the nominal MYR/USD rate and relative prices.

[3] The main sources of reference include *Historical Exchange Rate Regime of Asian Countries* [Online, available at http://intl.econ.cuhk.edu.hk/exchange_rate_regime, accessed on 17/5/2003] and Ariff (1991).

[4] Prior to the formation of Malaysia on 16 September 1965, the constituents of Malaysia (Peninsular Malaya and the states of Sawarak and Sabah) were British territories.