



# Dynamic linkage between real exchange rates and stock prices: Evidence from developed and emerging Asian markets <sup>☆</sup>



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## ABSTRACT

This paper investigates the sources of the dynamic relationship between real exchange rates and stock return differentials in relation to the US market for the developed and emerging Asian markets. We, first, derive the dynamic conditional correlation (DCC) of the two series, and then DCC is regressed on the trade balance and the interest rate differentials. In general, the trade balance is found to be a main determinant of the dynamic correlation for the Asian markets, whereas the interest rate differential is the driving force for the developed markets. The latter seems to reflect the high capital mobility.

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## 1. Introduction

During the past decade, a growing literature has emerged in an attempt to explore the relationship between exchange rates and stock prices; see, for example, Abdalla and Murinde (1997), Ajayi, Friedman, and Mehdian (1998), Granger, Huang, and Yang (2000), Smyth and Nandha (2003) Phylaktis and Ravazzolo (2005), Moore (2007a, 2007b), Lin (2012), and Kodongo and Ojah (2012). Empirically, the presence of a significant relationship between the two variables is found elsewhere. For example, Hatemi-J and Irandoust (2002) report that the Granger causality is unidirectional, running from stock prices to exchange rates, and an increase in Swedish stock prices is found to be associated with an appreciation of the Swedish Krona. Moore (2007b) finds a cointegration relationship between stock prices and exchange rates for Poland and Hungary by taking into account the potential structural breaks in the two markets. See also Bahmani-Oskooee and Sohrabian (1992) and Nieh and Lee (2001) for the cointegration approach. Other studies include Malliaropoulos (1998), who examined the link between international stock return differentials and deviation from relative purchasing power parity (PPP) for four major OECD countries using the VAR approach. The volatility spillovers between stock returns and changes in exchange rates are examined in the work of Kanas (2000).

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There are, *inter alia*, two strands of classical theories suggesting a relation between stock prices and exchange rates. 'Flow-oriented' models of exchange rates focus on the current account or the trade balance and assert that the currency movement will affect the international competitiveness and the balance of trade position, which in turn affects the country's real income/output and therefore stock prices (Dornbusch & Fisher, 1980). This is based on the traditional macroeconomic view. On the other hand, 'stock-oriented' models of exchange rates, or portfolio balance approaches, predict that the innovations in the stock price affect exchange rates via the capital account (Branson, 1983; Frankel, 1983): the performance of the stock market may affect the demand for money, with the subsequent changes in interest rates causing exchange rates to appreciate or depreciate.

The relationship between the two series has been theoretically and empirically established, however, the issue of driving forces behind the linkage remains to be unexplored.

This paper aims at investigating the dynamic relation between exchange rates and stock prices and exploring the sources behind the linkage. A two-step estimation procedure is employed. In the first procedure, we derive the dynamic conditional correlation (DCC) advanced by Engle (2002) of the two series, and in the second step, a linear regression model is specified, where the estimated DCC is regressed on the potential determinants of the correlation. Our sample countries include the emerging Asian countries of Indonesia, Malaysia, South Korea, the Philippines, Singapore and Thailand,<sup>2</sup> and the developed countries of Australia, Canada, Japan and the UK for the sample period from 1970s and 1980s to 2006. A relatively wider set of countries may serve to provide an unbiased insight into the inquiry of the relationship between the stock prices and exchange rates.

There are a number of important contributions to the literature. Firstly, the technique of dynamic correlation demonstrates a more direct indication of interdependence between stock and foreign exchange markets, where the dynamics of correlation are modelled together with those of the volatility of the series.<sup>3</sup> In order to examine varying degrees of relationship, previous studies normally partition the sample period into different phases according to structural changes. Such a subjective designation of cut-off dates may not effectively describe the evolution of the changes on financial markets over time. By accounting for the time-varying conditional correlation of data series, possible changes in conditional correlations can be detected when the state of the economy changes over time, and that this is a rigorous approach in examining the fast-moving volatile stock and foreign exchange markets of the emerging economies.<sup>4</sup>

Secondly, correlation tests are conducted for the variables of real exchange rates and the stock price differentials against the US market. It is argued that much empirical study tends to omit the US stock market, despite the fact that it represents the influence of world markets, and that it has been shown that the results of some of the previous studies are invalid (Caporale & Pittis, 1997). Phylaktis and Ravazzolo (2005) found that it acts as a conduit through which the real exchange rate affects the stock market or vice versa. Thirdly, the paper clarifies the theoretical issues of the relationship by assuming that both real exchange rates and stock price differentials contain permanent and temporary components (Baxter, 1994; Fama & French, 1988; Huizinga, 1987; Poterba & Summers, 1988). The theoretical model, which largely follows that of Malliaropoulos (1998), predicts a negative relationship.

The fourth contribution, which is the primal objective of this paper, is to investigate the determinants of the dynamic link between the two series. In a linear regression framework, the potential determinants as regressors are explicitly specified.

We consider the trade balance and the interest rate differentials as possible determinants of the linkage. The variable of trade balance is deemed to capture the extent of the open characteristics of these economies in terms of exports and imports with the US. Hence if the variable strongly impact on the correlation, economic integration may matter for the linkage. Given that of interest rate differentials, the degree of capital market integration between these countries and the US is gauged as a channel to the correlation of stock and foreign exchange markets. If this effect is significant, financial integration plays a major role for the linkage. The former is based on the traditional macroeconomic view (or the flow-oriented model), while the latter is associated with the portfolio balance model (or the stock-oriented model). The inclusion of the mature financial markets may provide a useful comparative study with the emerging Asian markets, where foreign capital restrictions tend to be prevalent. In this respect, our study may shed a new light on the debate of the two theories by addressing the sources of the correlation in a rigorous empirical framework.

The overall results are summarised as follows. We find a negative dynamic relationship between the relative stock prices and real exchange rates, being consistent with the model prediction. A linear regression model reveals that the trade balance is, in general, the main source of the dynamic correlation for the Asian countries, whereas the interest rate differential is a contributory factor for Australia, Canada and the UK. This appears to suggest that in countries with a relatively low degree of capital mobility, economic integration is likely to be the main force of the linkage, supporting the flow-oriented model, whereas in countries with the high capital mobility, financial integration is the main driving force, supporting the stock-oriented model. When the Asian markets are modelled in the post-Asian crisis period as a subsample period, the driving force slants to the interest rate differentials. This is indicative of the improved capital mobility after the crisis for the Asian emerging market.

<sup>2</sup> Several studies established the linkage between stock prices and exchange rates for the Asian countries (see Abdalla & Murinde, 1997; Ajayi et al., 1998; Granger et al., 2000; Phylaktis & Ravazzolo, 2005; Smyth & Nandha, 2003).

<sup>3</sup> Forbes and Rigobon (2002) argue that the cross market correlation coefficients are conditional on market volatility, and if such a test is not adjusted for heteroskedasticity, the estimated correlation coefficients can be biased.

<sup>4</sup> The methodology has been utilised for financial analysis; see for example, Chiang, Jeon, and Li (2007) and Wang and Moore (2008) for the study of stock market contagion and comovements, and also Bautista (2006) for the investigation of the relationship between exchange rates and interest rate differentials in six East Asian countries.

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