



# Market integration and contagion: Evidence from Asian emerging stock and foreign exchange markets

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## Abstract

This paper examines whether Asian emerging stock markets (India, Korea, Malaysia, Philippines, Taiwan, and Thailand) have become integrated into world capital markets since their official liberalization dates by estimating and testing a dynamic integrated international capital asset pricing model (ICAPM) in the absence of purchasing power parity (PPP) using an asymmetric multivariate GARCH(1,1)-in-Mean approach. Also examined in this paper is whether there are pure contagion effects between stock and foreign exchange markets for each Asian country during the 1997 Asian crisis. The empirical results show that first, both currency and world market risks are priced and time-varying, suggesting that an international asset pricing model under PPP and constant price of risk might give rise to model misspecification. Second, the stock markets for India, Korea, Malaysia, Philippines, and Thailand were segmented from the world capital markets before their liberalization dates, but all six markets have become fully integrated since then. Third, the market liberalization has reduced the cost of capital and price volatility for most of the countries. Finally, as for the contagion effects, strong positive impact of return shocks originating from the domestic stock market to its foreign exchange market during the crisis is found. This dynamic relationship between stock market and foreign exchange market is consistent with stock-oriented exchange rate models.

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## 1. Introduction

A large number of Asian emerging markets have embarked on a series of reforms in recent years, including liberalization of their national stock markets. As a result of these developments and the important implications of market integration on international capital budgeting and investment, market integration has emerged as an important body of literature. Two recent examples of this literature that study the impact of market liberalization on market integration for Asian emerging markets are Bekaert and Harvey (1995) and De Santis and Imrohoroglu (1997).<sup>1</sup> Bekaert and Harvey (1995) propose a one-factor asset pricing model that allows the conditional expected returns of a country to be affected by their covariance with a world benchmark portfolio and by the variance of the country returns. They use a conditional regime-switching model to account for periods when national markets were segmented from world capital markets and when they became integrated later in the sample. In contrast to general perceptions that markets are becoming more integrated, their results suggest that some countries are becoming less integrated into the world market. However, based on specification tests, their model is rejected in most countries. They point out that one possible extension of their study is to consider currency risk as another potential priced factor. Instead of using the conditional regime-switching methodology, De Santis and Imrohoroglu (1997) utilize the multivariate GARCH(1,1)-in-Mean approach. They introduce a dynamic integration version of the classic CAPM framework that assumes full market segmentation until the official liberalization date of each market, and full integration thereafter to capture the fact that the analyzed markets were legally segmented for part of the sample period. Their empirical results show that neither the country-specific risk, nor the world market risk is priced and thus no conclusion can be made regarding the impact of market liberalization on market integration. One possible common cause for the weak findings of De Santis and Imrohoroglu (1997) and the rejection of Bekaert and Harvey's model is that both assume purchasing power parity (PPP) and thus ignore currency risk, which motivates the current research. In addition to considering currency risk in testing market integration, this paper differs from Bekaert and Harvey (1995, 1997) and De Santis and Imrohoroglu (1997) in one important aspect. That is, the asset pricing model specified in this paper allows me to test not only market integration, but also contagion between local stock market and foreign exchange market during the 1997 Asian crisis, which will be explained next.

Due to a series of financial crises in the 1990s including the Exchange rate Mechanism (ERM) attacks of 1992, the Mexican peso collapse of 1994, the Asian crisis of 1997, the Russian collapse of 1998, and the Brazilian devaluation of 1999, the study of the transmission of financial shocks/crisis across markets/countries has also emerged as one of the most intensive research topics in international finance literature in recent years. Previous papers on this topic have failed to take into account an important distinction between the two concepts of *interdependence* and *contagion* except Forbes and Rigobon (2002).<sup>2</sup> Masson (1998) argues that there are three main channels that financial

<sup>1</sup> Earlier theoretical and empirical papers on market integration include Solnik (1974), Stehle (1977), Stulz (1981), Errunza and Losq (1985), Eun and Janakiramanan (1986), Jorion and Schwartz (1986), Wheatley (1988), and Errunza et al. (1992). More recent papers include Carrieri et al. (2001), Bekaert et al. (2002), and Hardouvelis et al. (in press). However, these papers either focus on developed markets or do not consider how market liberalization affects market integration. Instead of focusing on how market liberalization affects market integration, Obstfeld (1994), Bekaert et al. (2001, 2005a) and Henry (2000a) study the impact of market liberalization on the economic development of the underlying countries.

<sup>2</sup> Forbes and Rigobon (2002) define contagion as a significant increase in cross-market linkages after a shock to one country or group of countries, and find that there was virtually no increase in unconditional correlation coefficients during the 1997 Asian crisis and thus conclude that there was no contagion but interdependence. However, they also point out that their definition of contagion is not universally accepted, and therefore it warrants another examination of whether contagion did occur during the 1997 Asian crisis.

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