

Volatility and correlation in international stock markets and the role of exchange rate fluctuations

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Abstract

This paper develops a direct, explicit model for the role of exchange rate fluctuations in international stock markets and examines how and to what extent volatility and correlations in equity markets are influenced by exchange rate fluctuations. Evidence presented in this paper indicates that a higher foreign exchange rate variability mostly increases local stock market volatility but decreases volatility for the US stock market. The extent to which stock market volatility is influenced by foreign exchange variability is greater for local markets than for the US market, due to the fact that exchange rate changes are more strongly correlated with local equity market returns than the US market returns. We find that a higher exchange rate fluctuation marginally decreases the US/local equity market correlation. While exchange rate fluctuations held a relatively large fraction of the variation in local stock market returns, there was no significant influence on the US/local equity market correlation.

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1. Introduction

The return from a foreign asset investment is comprised of the return on the foreign asset and the exchange rate fluctuation due to the fact that investing in foreign stock markets entails exposure to exchange rate risk. It is, thus, theoretically apparent that the US dollar return of a foreign stock investment is automatically influenced by exchange rate movements because

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the conversion process of local-currency returns into US dollar values has already introduced a direct link between exchange rates and the US dollar returns. Yet, empirical findings provide conflicting results for the linkage between exchange rate movements and stock market returns. Some researchers claim that exchange rate movements provide little or no explanation for US investors in making investment decisions (see Jorion, 1990, 1991; Amihud, 1993; Bartov and Bodnar, 1994; Bernard and Galati, 2000; and Griffin and Stulz, 2001), while others argue that stock returns in US dollars are significantly affected by exchange rate fluctuations (Roll, 1992; Ferson and Harvey, 1993; Dumas and Solnik, 1995; Chow et al., 1997; Choi et al., 1998; De Santis and Gerard, 1998; Doukas et al., 1999; and Patro et al., 2002). Although models and empirical methodologies vary widely, these studies explain the linkage between stock and foreign exchange markets using first moments in their analysis and thus ignore an important role of second moments in the linkage. A good understanding of the role of second moments in international stock and foreign exchange markets is important for international investors because any change in variances and cross-market correlations in international stock markets due to exchange rate movements makes it more difficult for them to select an optimal investment strategy.

Few studies focus on the linkage between stock and foreign exchange markets using second moments. Bartov et al. (1996) examine the relationship between exchange rate variability and stock return volatility for US multinational firms and find that there is a significant positive linkage between the two volatilities. Karolyi and Stulz (1996) examine the impact of a foreign exchange shock on the volatility and US/Japanese stock market correlation and find that a foreign exchange shock has a significantly positive impact on the volatility and US/Japanese market correlation. Bodart and Reding (1999) examine the impact of German exchange rate fluctuations on the stock market volatility and the correlation between the German stock market and a selected group of European markets (France, Belgium, UK, Sweden, and Italy). They find that there is no strong evidence that a higher exchange rate variability increases stock market volatility. They also find that sample markets' correlation with the German market declined when exchange rates were volatile, suggesting that a higher exchange rate variability for the German *mark* implied a lower cross-market correlation. While these studies examine the effect of exchange rate fluctuations on international stock market fundamentals, they fail to quantitatively measure the extent to which the stock market fundamentals can be accounted for by exchange rate fluctuations.

This paper presents a direct, explicit model for the role of exchange rate fluctuations in international stock market fundamentals and examines how and to what extent the equity market volatility and cross-market correlations are influenced by exchange rate fluctuations. In our model, the market volatility as well as the cross-market correlation is decomposed into fractions that are attributable to local market returns and exchange rate fluctuations, so that the role of exchange rate fluctuations can be explicitly identified relative to local stock market returns. To achieve the objective, the extent to which international stock market fundamentals are attributable to exchange rate fluctuations is quantitatively measured and tested for eight mature markets in relation to the US market (UK, France, Germany, Italy, Australia, Hong Kong, Japan, and Singapore).

We find that a higher exchange rate variability mostly increases local equity market volatility but decreases the US stock market volatility. Local stock markets are influenced to a larger extent by the exchange rate variability than the US market, due to the fact that exchange rate changes are more strongly correlated with local equity market returns than the US market returns. We also find that the exchange rate fluctuation has a marginally negative impact on the US/local equity market correlation.

The rest of the paper is organized as follows. Section 2 models the proportion of the stock market volatility/cross-market correlations that can be attributable to exchange rate fluctuations.

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