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# Realized spill-over effects between stock and foreign exchange market: Evidence from regional analysis<sup>☆</sup>

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## ABSTRACT

We employ high frequency data to investigate the spill-over effect between stock and foreign exchange (FX) markets in terms of return higher moments. We find a positive and bidirectional realized volatility spill-over effect between stock and FX markets. This result holds regardless of market properties (developed vs. emerging) and periods (crisis vs. non-crisis). Interestingly, our empirical results support a negative and bidirectional realized skewness spill-over effect between stock and FX markets in emerging regions. Overall, our analyses emphasize that it is important to account for the informational transmission through volatility and skewness in financial markets, especially during the turbulent periods.

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## 1. Introduction

The increasing integration of national economies in the international economy as well as market liberalization has increased the degree of inter-dependence between financial markets around the world. Among markets of interest, the relationship between stock and foreign exchange (FX) markets has attracted a significant amount of attention from both academics and practitioners over past few decades. Traditionally, the theoretical linkage between stock and FX markets has been explained by the “flow-oriented” approach (see [Dornbusch](#)

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and Fischer, 1980) and/or the “stock-oriented” approach (see Branson, 1993; Frankel, 1983 and Gavin, 1989).<sup>1</sup> These two approaches emphasize on the informational transmission mechanism, which causes the link between stock and FX prices, and thus their returns.

A vast number of studies have empirically investigated the co-movement between stock market prices and exchange rates (see among others, Ajayi and Mougoue, 1996; Bahmani-Oskooee and Sohrabian, 1992; Granger, Huang, and Yang, 2000; Jorion, 1990; or more recently, Caporale, Hunter, and Ali, 2014; Lin, 2012; and Pan, Fok, and Liu, 2007). Even though the entire body of literature shows mixed results about the interaction between stock market prices and exchange rates, more recent studies have consistently confirmed this relationship (e.g. Caporale et al., 2014; Lin, 2012). This might be due to an increasing integration among financial markets over the past twenty years (see Fratzscher, 2002; Graham, Kiviahio, and Nikkinen, 2012 and Vo and Daly, 2006). Since the stock and FX returns (as a first moment of the return distribution) are likely to be linked, it is a natural extension to examine whether the higher order moments of their returns are also linked. A better understanding about these types of linkage provides practical benefits in financial risk management, and therefore optimal asset allocation during the “extreme” events. Given the recent financial market turmoils over the past two decades, ability to capture financial linkages during the “extreme” events highlights the importance of our research.

Existing literature has extensively studied the volatility spill-over effect within stock or FX markets (see for example, Bhar and Nikolova, 2009; Darbar and Deb, 1997; Kim and Rogers, 1995; Karolyi, 1995; Kearney and Patton, 2000; and Speight and McMillan, 2001). More recent studies have also examined whether the level of inter-dependence within stock and FX markets has increased during the recent financial crisis (see for examples, Aloui, Ben Aissa, and Nguyen, 2011; Bubák, Kočenda, and Žikeš, 2011; Coudert, Couharde, and Mignon, 2011; Ding, Huang, and Pu, 2014; Dufrénot, Mignon, and Péguin-Feissolle, 2011; Kenourgios, Samitas, and Paltalidis, 2011; and Samarakoon, 2011). These studies have mainly found a positive volatility spill-over effect within stock and FX markets and the inter-dependence tends to be greater during the financial turbulent periods. However, we have observed very few studies considering the volatility transmission mechanism between stock and FX markets, especially under an impact of the recent financial crisis. During the financial turbulence, the volatility of stock markets tends to be higher (e.g. Climent and Meneu, 2003; Guo, Chen, and Huang, 2011), which may lead to speculative actions and capital flight to value. This can finally result in a greater instability in other markets such as FX markets (see Caporale et al., 2014). On the other direction, a greater volatility in FX markets may significantly change the international competitive of a country and thus, the real income and output. This may ultimately cause considerable variability in stock markets because of changes in capital flows. To date, Caporale et al. (2014) is the only study investigating the volatility transmission between stock and FX markets during the recent crisis. Hence, our paper complements Caporale et al. (2014) by extending volatility linkage between stock and FX markets analysis to different regions around the world. Specifically, we examine whether the nature of this volatility linkage changes under the condition of financial turmoil.

In contrast with the literature on volatility spill-over, the areas of skewness and kurtosis spill-over attract much less attention. While we find no previous study about kurtosis spill-over, a few studies explore skewness spill-over within equity markets (e.g. Hashmi and Tay, 2007; Korkie, Sivakumar, and Turtle, 2006). The importance of an investigation on informational transmission mechanism via return higher moments is highlighted by Korkie et al. (2006), who support for a skewness spill-over effect within stock markets. Their result suggests that the effect of “extreme” events (captured by return higher moments) in one market can spill-over to other markets. Hence, it is interesting to investigate whether this effect can be transmitted across different types of asset markets, especially during the financial crisis when the “extreme” events are more pronounced. Surprisingly, there is a dearth of attention on how asymmetry risks (captured by skewness) and fat tail risks (captured by kurtosis) are transmitted between stock and FX markets.

The primary objective of this paper is to contribute to the literature of linkage between stock and FX markets by answering the following two key research questions: (i) how stock markets are linked to FX markets via their return higher moments?; and (ii) does this linkage change under the recent financial crisis? We

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<sup>1</sup> “Flow-oriented” models of exchange rates propose that stock prices, determined as present values of future firms’ cash flows, will finally react to the exchange rate changes because of the influence of exchange rate changes on international competitiveness, and thus national real income and output. Meanwhile, the “stock-oriented” models of exchange rates explain how information flows from stock markets make changes in FX markets. The latter models propose that changes in stock markets affect the levels of wealth and liquidity, which in turn influence money demand.

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