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# Cascading effect of contagion in Indian stock market: Evidence from reachable stocks

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**Abstract** The financial turbulence in a country percolates to another along the trajectories of reachable stocks owned by foreign investors. To indemnify the losses originating from the crisis country, foreign investors dispose of shares in other markets triggering a contagion in an unrelated market. This paper provides empirical evidence for the stock market crisis that spreads globally through investors owning international portfolios, with special reference to the global financial crisis of 2008–09. Using two-step Limited Information Maximum Likelihood estimation and Murphy-Topel variance estimate, the results show that reachability plays a crucial role in the transposal of distress from one country to another, explaining investor-induced contagion in the Indian stock market.

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## Introduction

The financial crises that have occurred in the last few decades, especially in the financial markets of emerging economies, have raised issues pertaining to the vulnerability of rapidly growing economies. Among these financial crises are the 1992 crisis of the European exchange rate mechanism, the Mexican peso crash of 1994, the 1997 East Asian crisis, the 1998 Russian collapse, long term capital management crisis of 1998, the 1999 Brazilian devaluation and technological crisis, the global financial crisis of 2008, and the recent decrease in the currency exchange rate of 2013 in India. The 1997 East Asian crisis, termed “Asian Flu”, generated a lot of interest among

economists and policymakers as the currency and stock market shock initially affected Thailand and then gradually spread to the rest of the world. Similar to the 1997 East Asian Crisis, most of the other crises provided strong evidence for the transmission of crisis from the affected country to the rest of the world. One striking feature common to all crises was that the co-movement of financial markets was more pronounced in the turmoil period than in the tranquil period.

Although exceedingly high co-movement among countries with strong financial and economic relationship via trade linkages can be rationalised, the pattern across countries devoid of common linkages is challenging, as opined by Kodres and Pritsker (2002). Prior studies such as Solnik (1974) and Adler and Dumas (1983) stress the role of domestic factors in stock price movement across the world. Further, in a globalised scenario, the co-movement of international markets cannot be predicated on fundamental factors alone. The channels for propagation of shocks include the co-movement in exchange rates, capital flows, share prices, and sovereign spreads.

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In accordance with [Claessens, Dornbusch, and Park \(2001\)](#), we classify the concept of contagion into two broad categories. The first category, consisting of studies emphasising the spillovers from normal interdependence among economies connected via trade ([Abeyesinghe & Forbes, 2005](#); [Chan, Chao, & Chou, 2002](#); [Eichengreen, Rose, & Wyplosz, 1996](#); [Forbes, 2002](#); [Glick & Rose, 1999](#); [Kali & Reyes, 2010](#); [N'Diaye, Zhang, & Zhang, 2010](#); [Xue, He, & Shao, 2012](#)) and financial links ([Baig & Goldfajn, 1999](#); [Kaminsky & Reinhart, 2000](#); [Van Rijckeghem & Weder, 2001, 2003](#)) is termed as fundamental contagion ([Calvo & Reinhart, 1996](#)). The second category emphasises dissemination of shocks inconsistent with macro-economic fundamentals and is entirely dependent on the irrational behaviour of investors; it is termed as investor influenced contagion ([Horta, Lagoa, & Martins, 2016](#); [Masson, 1999](#); [Petmezas & Santamaria, 2014](#); [Rigobon, 2003](#)).

[Kaminsky and Reinhart \(2000\)](#) define contagion as the cross-country transpose of shocks, and include the fundamental link as a channel for contagion. Conversely, [Masson \(1999\)](#) implies contagion as the transpose of shocks to other countries, which are far from any fundamental linkage. This is in line with [Eichengreen et al. \(1996\)](#) and [Edwards \(2000\)](#) who argue that even after controlling the macro-economic fundamentals, the probability of crisis in a country increases based on the occurrence of distress elsewhere. The correlation that is left over even after controlling the effect of fundamentals and common distress is characterised as contagion and is often termed as excess co-movement. The reason behind the excess co-movement is the herding behaviour observed among the market participants. [Forbes and Rigobon \(2001\)](#) used the term "shift contagion", wherein there is transmission of distress to other countries and these transmissions are extreme during turmoil times in contrast with tranquil times.

Studies such as [Karolyi and Stulz \(1996\)](#), [Connolly and Wang \(2003\)](#), and [King, Sentana, and Wadhvani \(1994\)](#) made a demarcation between the influence of fundamentals and that of investors that drives stock market co-movements. Their findings proved that the major factors influencing stock market co-movements are the unobservable factors or the investors' behaviour. Contrary to the above studies, [Boyer, Kumagai, and Yuan \(2006\)](#) investigated contagion from an investor's perspective through the asset holdings of investors owning stocks in diverse markets. In developing markets, foreign investors are restricted in terms of accessibility, from investing in all publicly listed stocks. The distinction between stocks that are "reachable" to foreign investors and remote stocks (accessible only to domestic investors) helps to differentiate between fundamental and investor-induced contagion.

Following [Boyer et al. \(2006\)](#) it can be postulated that when country A (the U.S.) is afflicted by a country-specific crisis (subprime crisis of 2006), international investors have to sell country B (India)'s reachable stocks to encounter extremity calls. This selling of country B's reachable stocks is unassociated with the economic fundamentals of country B but can cause a price decline in its reachable stocks. If the price downturn in country B's reachable stocks is serious, local B investors may also be compelled to pay off their possessions in country B's (reachable and remote) stocks to encounter margin needs. Consequently, the typical shock or distress in country A, if acute, may eventually disseminate to country B's remote stocks.

The present study examines the existence of contagion in the Indian market, with special reference to reachable Indian stocks. Contagion effects of stock market crisis are diffused universally through investors owning international portfolios. The spread of this shock or disturbance from one region or economy affects the rest of the world. Financial contagion affects the financial institutions or financial sectors in an economy. For clarity, we classified Indian stocks into reachable and remote stocks. Reachable stocks are those that are designated as accessible to and frequently traded by foreigners, and remote stocks are those that are accessible only to local investors. The reachable and remote stocks traded were used to compare the degree of co-movement of these stocks in crisis-prone countries. With the support of these reachable and remote stocks, contagion was tested separately for the global financial crisis of 2008 and the recent 2013 rupee downfall. In the year 2013, on August 28th, the Indian rupee plummeted to a record low against the US dollar, nearing 69 rupees to the dollar, marking the biggest downfall in 18 years and engendering a crisis scenario in the Indian market. Notwithstanding that the Reserve Bank of India (RBI)'s involvement resuscitated the market, our study crosschecked the impact of the 2013 rupee downfall crisis and the global financial crisis of 2008 in the market through the reachability factor. In this context, contagion is defined as the significant notable increase in co-movement between countries after a shock; this is consistent with [Forbes and Rigobon \(2001\)](#) on contagion. Forbes and Rigobon point out that contagion is visible not only when there is transmission of distress to other countries, but also that these transmissions are intense during turmoil periods in contrast with tranquil periods, and that this is referred to as shift contagion.

The remainder of the paper is organised as follows. The second section discusses the literature review. The third section presents the methodology and hypothesis used to check contagion effect in the Indian economy, with special reference to investor-induced contagion. The fourth section presents empirical interpretations, and the fifth section concludes the paper.

## Review of literature

The expectation of rational investors includes an arbitrary element, termed as "noise" by [Black \(1986\)](#), which cannot be ignored in the asset pricing information. These irrational investors are often overlooked by the proponents of rational arbitrageurs (such as [Friedman, 1953](#) and [Fama, 1965](#)) who argue that the rational arbitrageurs will trade against the irrational investors and force the convergence of prices towards fundamentals. However, empirical evidence ranging from [DeLong, Shleifer, Summers, and Waldmann \(1990\)](#) and [Shleifer and Vishny \(1997\)](#) proves that asset prices break the barriers of economic fundamentals. The burgeoning literature on contagion gives a multitude of reasons for the transmission of noise. One interesting pattern that has emerged shows that emerging markets mainly take the brunt of these shocks and the effect is more during a crisis ([Williamson, 2004](#)).

There exists much literature for testing the existence of contagion during financial crises. Notable among the literature

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