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Financial contagion and capital asset pricing in Africa: The impact of the 2007–09 and Euro-Zone crises on natural resources sector Beta in African emerging markets

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ABSTRACT

This paper contributes to the literature by extending the interpretation of financial contagion beyond that of the market correlation approach popularised by Forbes and Rigobon (2002). Contagion is explored from the perspective of its impact on the conditional sector-risk Beta of the African Emerging Market natural resources sector. A multi-factor CAPM model is developed within a DCC-MGARCH framework to estimate time-varying Beta. We find that this reacts in different ways to different contagion events. It rose by a statistically significant 0.058 (an 8% increase) in response to the euro-zone crisis. However, with the exception of South Africa, the 2007–09 crisis was found to have no significant impact on Beta. We speculate that the differences found can be attributed to the different ways in which individual contagion events impact on individual markets. From this we conclude that ‘one size fits all’ correlations-based contagion analysis can often hide as much as it reveals.

1. Introduction, aims and literature

The global financial crisis of 2007–09 and the more recent Euro-zone crisis have led to the term ‘contagion’ becoming an increasingly important element of the financial lexicon. Forbes and Rigobon (2002) measured this in terms of an increase in correlation and describe it as “a significant increase in cross-market linkages resulting from a shock hitting a country or a group of countries”. In this paper we contend that we should also consider further ways of extending our understanding of contagion given that individual crisis are very much unique in nature.

We contribute to the literature by examining African Emerging Markets (AEM) contagion events in terms of the impact of the 2007–09 and Euro-zone crises on relative sector-risk (sector Beta). We focus on the natural resources sector given that this dominates AEM stock listings. For example, in South Africa, Basic Materials represent over 25% of stocks on the JSE (Mayer, 2014), and resource-driven stocks in Egypt and Morocco form about 38.4% and 15.3% of their respective market capitalisations (Hearn, 2011).

A number of studies have been undertaken of contagion in Africa using the correlation-based approach popularised by King and Wadhvani (1990) and Forbes and Rigobon (2002). For example, Asongu (2011) used it to identify contagion in response to the Kenyan crisis of 2007–08 and Bello and Rodgers (2016) used a dynamic conditional correlation based variant to find evidence of contagion from the 2007–09 global financial crisis to African Frontier markets. Separately, Bello (2014) also found correlation contagion in African emerging markets during this period. A number of alternative methodologies have also been explored in the literature. For example, Aizenman et al. (2016), using an event study, found a distinction between the impact of ‘global crisis news’

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and ‘euro crisis news’ on developing African countries. Using quantile regression model along with Coexistence, [Chevapatrakul and Tee \(2014\)](#) investigated how news events contributed to contagion events on stock market indices during the 2007–09 financial crisis. In a more recent study, [Jin and An \(2016\)](#), employed the volatility impulse response approach (VIRF) and found contagion from the US to BRICS stock markets also during the 2007–09 financial crisis. Other researchers have focused on the importance of contagion channels; for example, [Essers \(2013\)](#) and [Allen and Giovannetti \(2011\)](#). Their studies identified potential channels as: trade, terms of trade, tourism, foreign direct investment (and land acquisition particularly), private capital flows, remittances and international bilateral aid.

In this paper we argue that contagion methodology can be developed further through an examination of the impact of contagion on sector-risk Beta. However, in an AEM context considerable care is required in identifying the form of Capital Asset Pricing Model (CAPM) used given the unique characteristics of these stock markets. Asset-pricing studies have developed enormously following the seminal work of [Sharpe \(1964\)](#) and [Lintner \(1965\)](#). Some of the more important papers include: [Merton \(1973\)](#), [Fama and French \(1992\)](#), [Carhart \(1997\)](#) and [Pástor and Stambaugh \(2003\)](#). Previous studies have focused mainly on developed markets and the emerging markets of Asia and Latin America. Historically, there has been limited research in Africa, however, more recently researchers have begun to turn their attention to these markets; for example, [Omran \(2007\)](#), [Hearn and Piesse \(2009\)](#) and [Alagidede \(2011\)](#). The methodological issues raised in these papers are taken into consideration in the multi-factor CAPM developed for our study. This model is described in Section 3 and results are presented in Section 4. Finally, a discussion is undertaken and conclusions are drawn in Section 5.

2. Data description

Identifying the ‘window’ of any contagion event is potentially problematic. This is especially significant for both the 2007–09 and euro-zone crises as both developed over relatively long periods and contained a series of sub-events.

Researchers do, however, have at their disposal, the VIX index in the United States and the VDAX in Germany to help identify which periods produced the greatest ‘shock’ to investors. These two indices are popularly known as ‘fear gauges’ given their forward-looking properties. Both showed a series of spikes associated with key crisis events and we use these to identify periods of contagion (see [Fig. 1](#)).

The first major spike in the VIX occurred in the last quarter of 2008 and was associated with the period that culminated in Lehman Brothers bankruptcy (15th September) but which also included: Federal Government conservatorship of Fannie Mae and Freddie Mac (7th September), the emergency US\$85 billion loan to insurer AIG (17th September) and the sale of Merrill Lynch to Bank of America (14th September). For a list of news events during the crisis, see [Chevapatrakul and Tee \(2014\)](#).

The Lehman bankruptcy was the defining event of the crisis; we therefore use 15th September 2008 to identify the start of the crisis period. The VIX remained high well into 2009, which is an indication that this particular crisis was not the type of short-sharp-shock modelled previously in the contagion literature (For example, [Forbes and Rigobon, 2002](#)). A further series of shocks occurred post-Lehman; for example, October 2008 saw the introduction of the US\$700 billion TARP programme and November saw the US government having to rescue Citigroup after speculators drove its share price down 60%.

We also define the end point of the 2007–09 crisis using the VIX. The index started reverting back to its (2000–2010) average by early October 2009. This gives an indication that market expectations were that the crisis was drawing to a close. On this basis, the

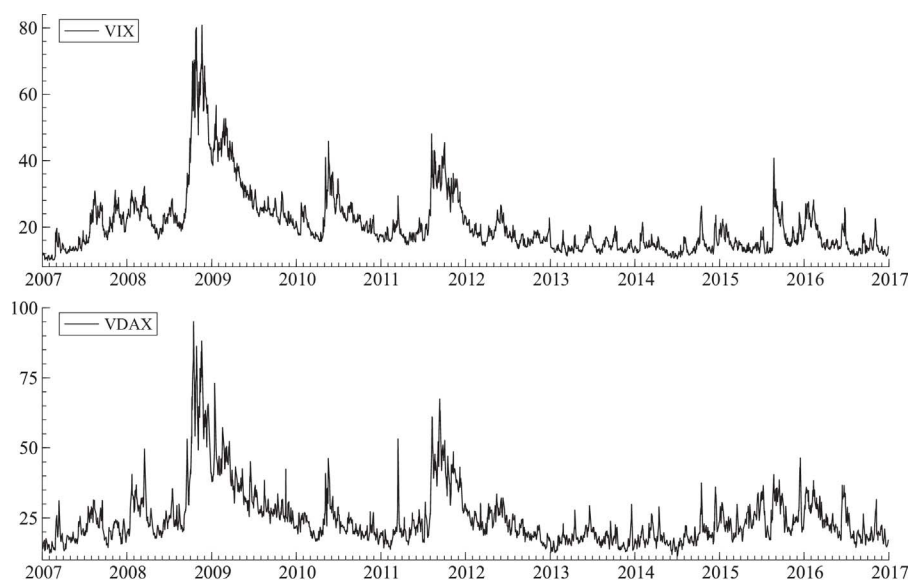


Fig. 1. VIX and VDAX Volatility Indices 2007–2017.

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