Research in International Business and Finance 36 (2016) 297–311

Contents lists available at ScienceDirect

Research in International Business and Finance

journal homepage: www.elsevier.com/locate/ribaf

Return and volatility interdependences in up and down markets across developed and emerging countries

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ARTICLE INFO

Article history:
Received 18 September 2014
Received in revised form 2 April 2015
Accepted 10 September 2015
Available online 28 September 2015

JEL classification:
C12
C32
C51
C52
G1

Keywords:
Up-down market
Risk-return relationship
DCC
MGARCH
Spillover effects

ABSTRACT

In this paper, we have used daily stock returns data from two developed and four emerging countries to analyse the behaviour of returns and volatility spillovers in two different stock market conditions called the up and down markets. To this end, we have proposed a VAR-TGARCH-M type model and incorporated the smooth transition behaviour to switch from one market condition to another. The results show that, in general, there is significant and asymmetric effect of returns and volatility of one market on another in up and down market conditions, but the sign of the effect varies over pairs of countries concerned and also of market conditions.

1. Introduction

The analysis of international financial systems and interconnections of markets has received much attention in recent years. Empirical modelling of such interconnections are important for investors to get insights into the treading and hedging strategy of international portfolio diversifications. It is mentioned in the literature that if one stock market is weakly related to another market, external shocks will have less influence on the former market and hence investors of the latter can benefit by investing in the former market as portfolio diversification reduces risk. In the early literature, Solnik (1974) showed that US investors may get benefit by international investment as the correlations between the US and non-US stock returns are low. Following this, Eun and Shim (1989), Hamao et al. (1990), and Jeon and Von Frustenberg (1990), among others, provided early evidence of international integration and interactions across different markets.

Kyle (1985) was the first to indicate that volatility of price revealed much information than the price itself. Following him, numerous researchers have studied return-volatility relation of different markets. Until mid-1970s, financial economists believed that the risk premium on one particular asset should be determined in that particular market and should not

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http://dx.doi.org/10.1016/j.ribaf.2015.09.023
0275-5319/

be affected by foreign capital market though assets constitute most of the wealth traded on internationally integrated markets. However, as the capital markets become increasingly integrated, the risk premium of an asset may then be primarily determined by world capital market. This suggests that risk premium of the market portfolio of an asset depends on the covariance of its returns with the returns of the world market portfolio. Even if, the capital asset pricing model does not hold, the covariance may be an important determinant of the risk premium. It may be mentioned, in this context, that using a bivariate GARCH-in-mean model, Chan et al. (1992) showed that conditional expected excess returns on the US market are significantly related to the conditional covariance with Japanese stock index, but not to the conditional variance of the US stock index. Further, Theodossiou and Lee (1993) examined the spillover effects of five major stock markets viz., the US, the UK, Japan, Canada and Germany and found significant mean spillover from the US market to the other stock markets. Taking the data of advanced countries, King and Wadhwani (1990) and Schwert (1990) examined the spillover effects of major markets before and after the US market crash. Bae and Andrew Karolyi (1994) and Koutmos and Booth (1995) showed evidence of the asymmetric volatility transmission of positive and negative shocks. Further, Lin et al. (1994) pointed out the differences between the transmission of global and local shocks.

With the increasing importance of emerging markets, the study of relationship involving emerging and developed markets has also received impetus and attention of researchers since results are likely to indicate benefits of international diversification and investment in emerging markets (Goetzmann et al., 2005). Using the multivariate GARCH model, Worthington and Higgs (2004) have found that the transmission of returns and volatility among some developed and emerging markets in Asia are non-homogeneous. Li (2007) has found that Chinese stock market is closely related to the Hong Kong market but weakly related to the US stock market. In addition, Ng (2000), Wang et al. (2004, 2005), Li (2012), have also examined the spillovers between developed and emerging stock markets.[1].

In the literature on studying spillover effects in two or more markets, there is some evidence that it varies with the magnitude of volatility of stock returns. For instance, Bertero and Mayer (1990), King and Wadhwani (1990), Longin and Solnik (2001), Ang and Bekaert (2002) and Baele (2005) have shown that during periods of high volatility correlation between markets is higher than that of low volatile periods. Hence, spillover effects are subject to time and state variations. But such studies have focused on the time-varying nature of market integration by high and low volatility periods. However, it is also possible that direct and indirect effects of return and volatility of the cross border markets may vary with market conditions like the 'bull' and 'bear' markets or 'up' and 'down' markets. There are very few studies on this issue. In this context, it may be mentioned that some studies have suggested that risk-return relationship of a particular market may also be time-varying. Particularly, Levy (1974), and Fabozzi and Francis (1977, 1978) suggested that there is a need to separate betas of the capital asset pricing model between 'bull' and 'bear' markets.[2] Kim and Zumwalt (1979) and Chen (1982) applied threshold models using three threshold levels viz., average monthly market return, average risk free rate, and zero, and found no evidence to support instability of beta values, but concluded that investors like to receive a positive premium for accepting downside risk, while a negative premium is associated with the up-market beta[3]. Hence, it is quite relevant and important to study if the relationship between the return and volatility across markets is different/asymmetric in different market conditions like up and down market conditions.

Volatility transmission involving two or more markets are studied by using the multivariate GARCH (MGARCH) model. Several specifications of the MGARCH model are available of which the VEC model (Bollerslev et al., 1988)), the BEKK model proposed by Baba et al. (1990), and the conditional correlation GARCH model are quite well-known. Kasch-Haroutounian and Price (2001) employed both the constant conditional correlation (CCC) model proposed by Bollerslev (1990) and the BEKK model to examine the interdependences among the Central European stock markets. Scheicher (2001) examined the co-movements between three European emerging markets viz., the Czech Republic, Poland and Hungary during 1995–1997, using vector autoregression-CCC (VAR-CCC) model. The assumption that conditional correlation matrix being time-invariant in case of CCC model is unrealistic in many empirical applications. In fact, it is now well-established that correlation of stock returns are not constant through time. Correlations tend to rise with economic or equity market integration (see, for details, Erb and Viskanta (1994), Longin and Solnik (1995), and Goetzmann et al. (2005)). The time invariant conditional correlation model has been generalised by Tse and Tsui (2002), and Engle (2002) by incorporating the dynamic ARMA structure into the conditional correlation matrix. Savva and Aslanidis (2010), Naoui et al. (2010), Hwang et al. (2011), Bouaziz et al. (2012), Lean and Teng (2013), and Wang and Moore (2008) have used the dynamic conditional correlation (DCC) model to examine the time-varying nature of the spillovers in stock markets. Some other works, along this line, involving primarily emerging Asian stock markets are due to Edwards and Susmel (2001, 2003), Balasubramanyan and Susmel (2004), Yang (2005), Lanza et al. (2006), and Manera et al. (2006). It is only very recently that some works with the DCC model based on asymmetric volatility specification have been done (see, for instance, Wang and Thi, 2007; Asai, 2013; Celik, 2012; Lyocsa et al., 2012; Gjika and Horvath, 2013; and Lean and Teng, 2013).

[1] Some other studies involving developed and emerging markets are due to Liu (2014), Miyakoshi (2003), Wang and Wang (2010), Allen et al. (2013), Beirne et al. (2010), and Mukherjee and Mishra (2010).

[2] 'Bull' and 'bear' market conditions are mostly defined in the context of stock returns data at monthly/quarterly level. To classify 'up' and 'down' markets, which are mostly used in case of high frequency data, various definitions are used. For instance, when realised market returns are above (below) a threshold level, the market is said to be in the up (down) market state.

[3] see, for instance, Bhardwaj and Brooks (1993), Pettengill et al. (1995), Howton and Peterson (1998), Crombez and Vennet (2000), and Faff (2001), Granger and Silvapulle (2002), and Galagedera and Faff (2005) in this context.