Economic Modelling 39 (2014) 19–31

Contents lists available at ScienceDirect

Economic Modelling

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

Stock market integration of emerging Asian economies: Patterns and causes

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ARTICLE INFO

Article history:
Accepted 12 February 2014
Available online 15 March 2014

JEL classification:
G01
G11
G15

Keywords:
Stock market integration
DCC-GARCH model
Price differentials
Exchange rate risk
Trade linkages
GFC
EGARCH

ABSTRACT

In this study, we examine the patterns and causes of stock market integration of selected emerging Asian nations against the US, Australia, China, and India for the period 1 January 2001 to 31 March 2012. We compare patterns of market integration for countries on a daily, weekly, or monthly basis using the time-varying correlation technique, namely, GARCH-dynamic conditional correlations (DCCs). In doing so, we suggest that opportunities in cross border investment vary by frequencies. We also divide daily data into subsamples and find that correlations were strongest during the global financial crisis (GFC) of 2007–09. The time varying bilateral correlations are found to be highly volatile. We also investigate the causes of identified correlations and find that apart from the GFC, the underlying economic and financial conditions have also been responsible for the higher correlations between these stock markets.

1. Introduction

Asian markets have been generally perceived as having low exposure to global factors and therefore little integration with western economies (see Aityan et al., 2010; Harvey, 1993; Singh and Loh, 2010). Hence, incorporating emerging Asian market stocks in an investment portfolio was seen as part of attempting to increase returns and reduce risks (Johnson and Soenen, 2002). However, recent studies on market integration suggest that national stock markets have become much more correlated than in recent decades (see Arouri et al., 2012; Assidenou, 2011; Bartram and Bodnar, 2009; Chakrabarti, 2011; Dooley and Hutchinson, 2009; Pesaran and Pesaran, 2010; Syriopoulos, 2007). Some studies suggest that the global financial crisis (GFC) has been responsible for this high correlation in more recent times. For instance, Assidenou (2011) shows eight developed and two emerging stock markets that were co-integrated between September 2008 and August 2009. Mun and Brooks (2012) showed that, for 17 financial markets, volatility more than news played a key role in explaining the higher correlations amongst developed and emerging stock markets, although news became relatively more important in the GFC period. Chakrabarti (2011) showed that the volatility spillover effects intensified in the financial crisis for the eight Asia-Pacific stock markets, specifically during the period June 2007 to February 2009.

In this paper, we investigate two things. First, we examine the degree to which the selected emerging Asian markets are integrated with those of Australia, the US, China, and India. Second, we explain the causes of this correlation within the EGARCH framework. The relationship between these four groups (Asia–Australia; Asia–US; Asia–China; and Asia–India) is particularly interesting. From the perspective of trade and finance, Asia–US relations have been the closest. We are particularly interested in seeing how the Asia–US stock market relationship has evolved in the midst of the GFC and the struggles of the US economy to shake off its high unemployment rate, low consumer confidence and slow economic growth. Meanwhile, Australia has been one of the best performing western countries in the period 2006–2012. This is largely fuelled by high demand from Asia for Australia's mining output. With much stronger focus on the Asian region because of their trade relations, it is important to understand whether the Asia–Australia markets have become more synchronized. The shifting global economic power towards China and India is yet another recent economic trend that calls into question whether these two nations' markets are popular and integrated with Asia more than the two western countries. Against the two larger Asian (China and India) and two western markets, we examine the four other emerging Asian markets of Korea, Malaysia, Singapore, and Thailand. These four markets are chosen as they are

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http://dx.doi.org/10.1016/j.econmod.2014.02.012
0264-9993/

well developed and are the major stock markets in Asia compared to the other markets (for instance, Indonesia, Pakistan, and Sri Lanka).

To examine stock market integration between pairs of countries within the grouping referred to above, we calculate pairwise time-varying correlations. We use the ARMA-DCC-GARCH framework to derive the correlations for 22 pairs of countries using daily, weekly, and monthly returns of six Asian and two Western nations.[1] Within this analysis, we examine the dynamic conditional correlations over various subsamples, accounting for the impact of the GFC (which resulted in large share market losses during late 2008 and early 2009); as well as looking at the immediate pre- and post-GFC periods.

Our ARMA-DCC-GARCH(1,1) analysis suggests that correlations are time-varying and volatile, indicating that market correlations are dependent on exogenous shocks. Consistent with recent literature (described above), our subsample analysis suggests that the bilateral correlations were strongest during the GFC across all groupings. However, this does not suggest that GFC was the cause of the increasing correlations — a rise in asset returns correlations may be due to underlying trends, such as globalization, and not the recent financial crisis (also see Pesaran and Pesaran, 2010). Financial liberalization as well as the presence of country funds and/or cross-listed securities, also integrates national markets with the global capital market (see for instance, Bekaert, 1995). Moreover, there are studies that show a significant link between foreign investment flows and financial integration Recently, in a study of co-movement in stock market returns of the US and 83 countries, Didier et al. (2012), used several measures of trade, financial linkages and corporate, macroeconomic and financial risks. The authors found that financial linkages, including foreign investment flows, were the key drivers for the stronger correlations which they found during the GFC period between the US and other markets. They also found that trade was not an important factor during the crisis period.

Against this background, we examine the causes of the stock market integration for the period January 2001 to April 2012. We investigate the influence of trade linkages using variables such as the openness of the home country, bilateral trade relations, and real interest rate and inflation differentials. We also examine the influence of exchange rate risks which is an important consideration in international portfolio management. The impact of domestic market characteristics, in the form of local market size and performance is also examined. These variables have been captured by studies that examine market correlations (see, for instance, Bracker et al., 1999; Didier et al., 2012; Forbes and Chinn, 2004; Quinn and Voth, 2008; Wälti, 2011). So far, the literature on the causes of correlations only considers the OLS estimation method, which we find is inefficient as many of the OLS estimated residuals are found to suffer from heteroskedasticity. We utilize the Exponential GARCH (EGARCH) model which works well in such cases. This approach has the added advantage of detecting any asymmetric behavior in the variance of the correlations.

The rest of paper is organized as follows. In Section 2, we provide the preliminary analysis of the national stock market returns for developed and emerging countries examined here. We conduct the ARMA-DCC-GARCH(1,1) analyses using daily, monthly, and weekly data in Section 3. Section 4 examines whether the monthly pairwise time-varying correlations are driven by the GFC or, as well as, other factors, namely trade linkages, exchange rate risks and local stock market characteristics. The final section concludes the paper.

[1] Time-varying covariances are not considered because their estimation involves some practical difficulties such as a) overfitting problems and multiple local optima; b) failure to capture shifts in market conditions; and c) large computational costs (Wu et al., 2013). Furthermore, notice that in Appendix A, our paper uses the original DCC model which accounts for serial correlation and time varying heteroskedasticity in returns series. This study does not account for the possibility of asymmetric behavior in variances of returns. However, in Section 4, we examine the influence of asymmetric behavior on the variance of correlations.

2. Preliminary analysis of stock returns

We begin our analysis with a preliminary study of the daily and monthly share market returns for Australia, China, India, Malaysia, Korea, Singapore, Thailand and the US for the period January 2001 to April 2012. All share market returns are obtained from a commonly used source, Morgan Stanley Capital International (MSCI). All price indices are denominated in US dollars. The rate of returns is calculated as $ln\left({}^{P_t}/_{P_{t-1}}\right)$, where P_t is the MSCI price index.

We present the common descriptive statistics on daily and monthly frequencies in Panels 1 and 2 of Table 1. We generally find that stock returns in China, India, Korea, and Thailand are more volatile than those in the US or Australia. All returns exhibit negative skewness and excess kurtosis, which indicates they have a thicker tail and a higher peak than a normal distribution. The Jarque–Bera test rejects the normality assumption for all stock returns series, except for the monthly returns of Korea. We also examined the time series properties of the stock returns, using the conventional ADF and PP tests — results suggests that all the returns series are stationary.[2]

Next we test for the presence of the ARCH and GARCH effects. The standard Lagrange Multiplier (LM) test proposed by Engle (1982) is used to detect for the ARCH process. The ARCH LM test shows strong support for ARCH effects in each of the eight returns series. To test for the GARCH effects, we estimated the Q-statistics for serial correlation using both returns and squared returns. Serial correlation is evident in almost all monthly and daily returns series. The exceptions are the Singapore and Thailand monthly returns series. Serial correlation found in squared returns suggests the possibility of GARCH effects in these series.

The unconditional correlation coefficients are reported in Table 2. Here, we examine the correlation between the returns of Australia and the US against those of China, India, Korea, Malaysia, Singapore and Thailand (columns 2 and 3). The other two sets of correlation are between China and India against Korea, Malaysia, Singapore and Thailand (columns 4 and 5). We notice a positive correlation between the returns for the full sample and the GFC period. We find that the monthly correlations are larger than the daily correlations for both samples. We also notice that the daily and monthly correlations for the period 2008–2012 are much stronger than the full sample period. In the next section, we investigate the possibility of time-varying correlations using a multivariate dynamic conditional correlation (DCC) model.

3. Multivariate dynamic conditional correlation (DCC) analysis

In the previous section, we found that the stock returns are characterized by serial correlation and time-varying heteroskedasticity. To account for these features of the data in our estimation of the correlations, we use the DCC model developed by Engle (2002) (see Appendix A for details). This model involves a two-step estimation. The first step requires estimation of the variances via a univariate ARMA-GARCH(1,1) specification (this allows for the time varying volatility) and the second step requires estimation of the parameters that capture the dynamic nature of the correlations. The ARMA process is included in the mean equation to capture the impact of serial correlation in the data. The success of this model in capturing time variation in correlations has prompted researchers to introduce variants of the DCC model which allows for asymmetric dynamics in the variances (Cappiello et al., 2006; Sheppard, 2002). This paper is interested in a measure of correlations that is simple yet reliable enough to capture the features of the stock returns, which if left unaccounted for will pose serious econometric problems. On this account, we use the original DCC model (see Appendix A) which has proven to be reliable in empirical studies (see for instance, Heaney and Srianantha kumar, 2012). One issue with the

[2] We do not report the unit root results but these are available on request.