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Dependence patterns among Asian banking sector stocks: A copula approach

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ABSTRACT

Asian banks have recorded 22 banking crisis between 1945 and 2008 and its total share of years in a banking crisis since 1945 is 12.4%, the highest compared to all regions. Interestingly, most of the financial institutions in the region remained largely unscathed during the recent global financial crisis, mainly due to their strong liquidity and capital buffers. Yet, given the episodes of past crisis, the rapid increase in regional corporations and cross-border flows in the region, as well as the paramount importance of the banking sector in the Asian region, it is interesting to study how the banking sectors in the various economies co-move with each other. Against this backdrop, we examine the dependence structure between banking sectors in the region using copula functions. Several findings are documented. First, average dependence generally remain at moderate levels, though dependence between the banking sectors of the developed Asian markets are relatively higher than the emerging markets. Second, we find evidence of asymmetric dependence, suggesting that banking sector returns co-movement varies in bearish and bullish markets. Third, our results show a mild increase in the bivariate dynamic correlations during crisis periods, indicating very limited risk of contagion. Our results provides significant implications for portfolio managers and policymakers.

1. Introduction

Asia has been the fastest-growing region in the world over the last two decades. The region is home to big investment banks and some of the large sovereign wealth funds in the world. The region has achieved great success economically, currently accounting for around 30 percent of Global GDP. A large part of this growth has been supported by robust financial sectors, which are predominantly bank-based. Most importantly, a manifestation of the rapid economic growth in the region over the years is seen in the banking sectors, which have become bigger and complex. Eight out of the 30 global systemically important banks (GSIBs), representing more than a quarter, operate in Asia (FSB, 2015).

The IMF's coordinated portfolio investments survey (CPIS) shows an increase in intra-regional demand for Asian equity and investment fund assets. For instance, between 2010 and 2015, the proportion of Asian equities and investment fund shares held across Asian countries rose from 16% to 25%. The higher intra-regional capital flows among Asian countries is attributed to the increased financial and economic integration. As a matter of fact, countries in Asia have undertaken wide-ranging commitments and concerted efforts towards economic and financial integration. For instance, in the periods after the 1997 crisis, East Asian countries have taken steps to deepen financial cooperation, as shown by the discussions on the Chiang Mai Initiative (CMI), the Asian bond

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market and notably the ASEAN Banking Integration Framework. It is therefore not surprising that the rapid economic expansion in Asia, particularly the East Asian region has been accompanied by increasing inter and intra-regional economic and financial integration. An important question is whether the increasing integration both within the region and with the global economy has resulted in higher degree of co-movement between the banking sectors in the region.

Understanding the dependence structure between banking sectors in different economies can help in diffusing a threat of systemic crisis, or at least in reducing the impact on neighbouring economies in the event of a crisis. In addition to being relevant for systemic risk management in general, the nature of co-movement has important implications for monetary policy, optimal asset allocation and capital adequacy, since estimating the reaction of one country to a crisis in another is only possible if the full dependence structure is known. Thus, a careful empirical evidence for the dependence structure of Asian banking sectors during different market conditions is necessary.

Much of the academic literature in this field has focused on analysing the co-movement between banking sectors in other regions, apart from Asia. For instance, Jokipii and Lucey (2007) documents that the Central and Eastern European banking sector co-movements are largely driven by contagion. Ludwig and Sobański (2014) investigate fragility linkages among banking sectors in the euro area during the 2007–2010 financial crisis and conclude that fragility linkages increased during the outbreak of the sub-prime crisis and remained elevated until the Greek bailout and the creation of the Eurozone-wide bailout funds in 2010. Employing gravity equations and a spline function on a panel of countries, Bouvatier and Delatte (2015) show that the international banking integration outside the euro area has been increasing since 1999 and has even strengthened after the global financial crisis. Yu (2017) study the bidirectional relationship between banking and sovereign debt crises in Europe and finds that sovereign default may induce a banking crisis as banks hold a large amount of government bonds. Employing GARCH models, Alexandrou et al. (2011) document that the introduction of the Euro and the enlargement of the European Union have strengthened the integration of the European banking industry. Maghyereh and Awartani (2012) study banking sector integration in the Gulf Cooperation Council using bootstrap techniques and find evidence of convergence during the transitional period 2003–2009.

Asian banks have recorded a total of 22 banking crisis between 1945 and 2008 and its total share of years in a banking crisis since 1945 is 12.4%, the highest compared to all regions (Reinhart and Rogoff, 2009). Interestingly, most of the financial institutions in the region remained largely unscathed during the recent global financial crisis, mainly due to their strong liquidity and capital buffers. Yet, given the episodes of past crisis, the rapid increase in regional corporations (such as ASEAN + 3[1]) and cross-border flows in the region, as well as the paramount importance of the banking sector in the Asian region, it is interesting to study how the banking sectors in the various economies co-move with each other. In spite of the numerous evidence of financial market integration across the region (Yu et al., 2010; Claus and Lucey, 2012; Wang, 2014), the dependence structure among the various banking sectors remains unclear. To date, only a smattering of papers have focused on the comovement between banking sectors in the region.

Our paper contributes to the related literature in two ways. First, we investigate the dependence structure between Asian banking sector stocks using copula functions. Copula functions can model the dependence structure among random variables, independently of different marginal distributions (Heinen and Valdesogo, 2012). Moreover, copula models simultaneously provide information on the average dependence, and the upper and lower tail dependences, which is essential when managing a portfolio's risk and designing financial system policies. Our second contribution is the use of industry level data (banking sector), rather than aggregate equity returns. Many researchers have modelled dependence structures using copula models, including Patton (2006, 2012a), Bhatti and Nguyen (2012), Hammoudeh et al. (2014) and Mensah and Alagidede (2017). However, these researchers did not consider the dependence structures between banking sector stocks in Asia. The importance of the banking sector in equity markets ought not to be downplayed for a number of reasons. To begin with, the banking sector offers critical pieces of information in regards to the general strength of the economy. In addition, a sturdy capital market hinges on a robust banking sector. For instance, listed companies depend on access to capital markets to support their growth. On the other hand, a robust, efficient capital market helps enhances more extensive growth that is beneficial to other sectors of the economy. Obviously, a strong banking sector is pivotal in providing accessibility, stability and liquidity to the financial markets. Leaving such a critical to a weaker banking sector might lead to a systemic failure of the economy (Shriber, 2015). Thus, we focused on banking sector stocks from selected Asian countries.

Specifically, we analysed the dependence structures between banking sector indices from 12 Asian markets: Hong Kong, Japan, Singapore, South Korea, Taiwan, China, Malaysia, India, the Philippines, Indonesia, Thailand, and Sri Lanka. We considered the period from January 4, 2000 to December 31, 2012. We fit the marginal distributions of the asset returns using the autoregressive moving average (ARMA) model with GARCH errors, and estimated the dependence using static and dynamic copula models.

Foreshadowing the main results, the empirical analyses suggest that the cross-sectional average copula correlations are generally moderate with slight upward trends for all twelve markets. This suggests that the Asian markets have not been fully integrated. This is particularly useful to investors because gains can be made by holding assets from Asian banking sectors, which could reduce portfolio risk, particularly during benign periods. We also found that tail dependences are asymmetric across the region. Market pairs tend to have significant lower tail dependences during extreme negative events, when compared with upper tail dependences. This suggests that investors react more towards bad news in other markets than good news. The dynamic path of the tail dependence shows sharp spikes in response to financial crises, suggesting that there could be joint crashes in the regional banking system during extreme negative events. Considering that most past major financial crises (the subprime and euro zone debt crises) did not begin in Asia, the broader implication of this finding is that banking sectors across the region can jointly crash in response to external shocks. Therefore,

[1] ASEAN + 3 comprise of member states of the Association of Southeast Asian Nations ((Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam) as well as China, Japan and South Korea.