Finance Research Letters 20 (2017) 40–46

Contents lists available at ScienceDirect

Finance Research Letters

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

Systemic risk in carry-trade portfolios☆

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ARTICLE INFO

Article history:
Received 29 June 2016
Revised 17 August 2016
Accepted 7 September 2016
Available online 8 September 2016

JEL classification:
G01
G15
G21

Keywords:
Carry trade
Systemic contagion
CoVaR model
Financial crisis

ABSTRACT

Risk contagion between carry trade portfolios and stock markets had been explored in literatures, leaving inconsistent controversy. Instead of exploring ordinary return-volatility spillovers, this paper focuses on a systemic contagion, the tail risk conditional on extreme events in other markets. Using a conditional value-at-risk (CoVaR) model, we contribute to this line of literature by showing that there is bilateral systemic contagion between carry trades and stock markets in the U.S., European, or Asia-Pacific regions. Such a systemic contagion is particularly significant during the 2000–2001 dot-com bubble and 2007–2009 U.S. credit crisis.

1. Introduction

Currency carry trades are implemented by investors who borrow currency from a country with a low interest rate and then convert that borrowed currency into currency from a country with a high interest rate in order to lend out or invest the proceeds. Such portfolios have become a popular speculative strategy to pursue higher-yielding assets. However, carry-trades should consider risk spillover from external markets (Dumas and Solnik, 1995; De Santis and Gerard, 1997; Darvas, 2009). For example, carry trades experienced large losses during the credit crunch, with the unwinding of many carry trades overlapping the drop in U.S. stock markets (Melvin and Taylor, 2009; Cassino and Wallis, 2010). Garnham (2009) note that when the global stock markets rebounded, carry-trade profits began to show a returning trend. Melvin and Taylor (2009) also address that the volatility in currency markets was accompanied with risk of other asset classes. Therefore, aside from the uncertainty of exchange rate movements (Darvas, 2009; Rendon, 2011), it is natural to question whether currency trades take on the burden of risk contagion from other markets.

Tail risk in carry trade portfolios is related to risk spillover from stock markets. Tse and Zhao (2012) find a significant volatility spillover from stock market to the carry-trade market, but not in the reverse direction. In addition, Lee and Chang (2013) show a significantly positive relationship between spillovers of currency carry trade returns and subsequent

☆ We appreciate valuable comments provided by anonymous journal reviewers, Ray Yeutien Chou of Academia Sinica, Tzu-Pu Chang from National Yunlin University of Science and Technology, and the participants of the 2015 Financial Economics Workshop at National Cheng Kung University. We also appreciate research funding provided by the Ministry of Science and Technology of Taiwan (Grant number: NSC 101-2410-H-224 -001).

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http://dx.doi.org/10.1016/j.frl.2016.09.007
1544-6123/

market returns, and the results is stronger in bear markets. Furthermore, Fung et al. (2013) find the volatility spillover effects between the carry trade and stock markets. Specifically, stock-to-carry volatility spillover during the crisis, while, in contrast, carry-to-stock volatility spillover during post-crisis period. Although ordinary volatility spillover between carry trades and stock markets had been explored, tail risk conditional on extreme events in another market was not addressed in prior research.[1] Such research gap motivates this study to extend this line of literature by exploring the systemic contagion between carry trade portfolios and stock markets.[2]

The mechanism through which carry trade portfolios and stock markets are highly related is that funds move globally to seek high-yielding assets (Brunnermeier and Pedersen, 2009; Fong, 2010; Fernández-Avilés et al., 2012; Alemany et al., 2015). When there are substantial losses in stock markets, capital outflows was inevitable to currency portfolios. Hartmann et al. (2004) and Brunnermeier et al. (2009) note that volatility risk from stock market downturn incurs higher risk in carry-trade markets. The investment currency, therefore, appreciates against the funding currency due to the imbalance of demand and supply (Ranaldo and Soderlind, 2010; Tse and Zhao, 2012). Aside from the risk spillover from stock market downturn, borrowing funds with very low rates are reinvested the proceeds in high-yielding stock markets. As capital flows into high-yielding stock markets, currency value appreciates in countries that are net capital recipients, leading to more volatile carry trade portfolios (Fung et al., 2013). Thus, capital flows contribute to closer links among carry-trade portfolios and stock markets with different trading of currencies, thereby causing systemic risk contagion (Boudreault et al., 2014).

We adopt a CoVaR model proposed by Adrian and Brunnermerier (2011) to explore systemic contagion between carry-trade portfolios and stock markets. Tse and Zhao (2012), Lee and Chamg (2013), and Fung, et al. (2013) adopt vector autoregressive model and bivariate EGARCH model to examine whether there is lead-lag causal relationship of returns between the carry trade and stock markets. Although these findings can effectively find the volatility spillover, their findings did not address the tail risk conditional on extreme events in other markets. CoVaR model, in contrast, focus on the tail risk conditional on extreme distress in other markets in excess of the norms of ordinary volatility-risk spillover. In addition, the CoVaR model not only uses a quantile regression without distributional assumption but also allows for a large range of possible quantiles for identifying extreme events.[3]

Using the CoVaR Model, the systemic contagion between carry-trade and stock markets (U.S., European, and Asia-Pacific region) is measured during different periods (2000–2001 dot-com bubble, 2002–2006 non-crisis, 2007–2009 credit crisis, and 2010–2012 European debt crises). Our results contribute to the literature in the following ways. First, although past studies had examined ordinary volatility risk spillovers, our study, in contrast, goes deeper to focus on systemic contagion between carry-trade portfolios and stock market. The CoVaR model used in this study can successfully measure the tail risk conditional on extreme events from both markets. Second, the empirical findings in prior research on volatility risk spillover between carry trades and stock markets are inconsistent, leaving controversies on the directions and timing of spillover. We find that there is bidirectional systemic contagion between currency carry trades and stock markets, regardless of the crisis or non-crisis periods, providing a complementary role in this line of research by showing that there are spillovers of tail risk conditional on extreme events between carry trades and stock markets. Third, we posit for practicality that ex ante analysis on systemic contagion across different markets is essential, helping investors to understand the manner in which risks spillover across markets over time and how they are interrelated and can be hedged (Ebrahim, 2000; Araç and Yalta, 2015).

2. Research methodology

2.1. Data and variables

For measuring systemic contagion, the tail risk is proxied by 1% quantiles of value-of-risk of asset returns. This study utilizes capital-weighted stock indices to calculate stock market returns by the difference in logarithm of daily stock indices, including the MSCI (Morgan Stanley Capital International) USA Index,[4] the MSCI European Index,[5] and the MSCI AC Asia Pacific Index.[6] For investigating systemic contagion between carry trades and stock markets, this study adopts a multi-

[1] Melvin and Taylor (2009); Cassino and Wallis (2010); Tse and Zhao (2012); Lee and Chang (2013); Fung et al. (2013).

[2] Ordinary volatility spillover is the volatility risk of asset returns that propagates all the time during each of the trading days, including the spillover of both of the small-magnitude volatility risk and extreme risk of bad events. While, systemic contagion explored in this study is the tail-distribution risk conditional on other external extremes (Adrian and Brunnermeier, 2011; Lopez-Espinosa et al., 2012).

[3] The systemic contagion from stock market to carry trades is the value-at-risk (VaR) of carry trade portfolios conditional on other stock markets being in distress in excess of the same VaR conditional on other stock markets in normal state. The systemic contagion from carry trades to stock market is similar but with inverse direction. All of the VaRs are based on 1% quantiles of asset return distribution. Systematic risk, with different perspective, is defined as the sensitivity of individual returns to market returns.

[4] The MSCI USA Index (USD) index is composed of large- and mid-cap enterprises in the U.S. market.

[5] The MSCI Europe Index (USD) index is composed of 16 European developed equity markets: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

[6] The MSCI All Country Asia Pacific Index (USD) is composed of 5 developed markets (Australia, Hong Kong, Japan, New Zealand, and Singapore) and 8 emerging markets (China, India, Indonesia, South Korea, Malaysia, Philippines, Taiwan, and Thailand).