New evidence on asymmetric return–volume dependence and extreme movements

Yi-Chiuan Wang, Jyh-Lin Wu, Yi-Hao Lai

1. Introduction

Stock returns and trading volumes are contemporaneously correlated as suggested by the Mixture Distribution Hypothesis (Epps and Epps, 1976; Tauchen and Pitts, 1983). In the bivariate mixture mode of Tauchen and Pitts (1983), a rise in the intensity of information flow increases both the mean and the variance of volume, as well as the variance of return. This in turn affects the dependence of return and volume. As for the relationship between stock returns and volumes, four different market statuses are observed: rising returns/rising volumes, falling returns/falling volumes, rising returns/falling volumes, and falling returns/rising volumes.1 The first (last) two market statuses are referred to as the positive (negative) return–volume dependence regime since returns and volumes move in the same direction (in different directions). Besides, the dependence of returns and volumes switches between positive and negative dependence regimes over time.

The above-mentioned four different market statuses are also implied by a model with heterogeneous investors and short-sale constraints (Chen et al., 2001b; Hong and Stein, 2003). Stock markets, under normal conditions, mainly reflect the positive private information from optimistic investors since pessimistic investors will not actively participate in the market due to short-sale constraints. The arrival of positive (negative) public information causes the rise (fall) of returns and volumes. However, pessimistic investors will actively participate in the market when markets decline, and hence accumulated hidden information tends to come out.
Markets mainly reflect the private information of pessimistic investors in such a case. Negative (Positive) public information causes the fall (rise) in returns and the rise (fall) in volumes.²

Empirical investigation of the return–volume dependence in stock markets is an interesting research topic in financial economics (Ying, 1966; Epps, 1975; Tauchen and Pitts, 1983; Karpoff, 1987). Several empirical models have been applied, such as linear regression models with a dummy variable to control positive and negative returns (Jain and Joh, 1988; Assogbavi et al., 1995), GARCH-type models (Lamoureux and Lastrapes, 1990; Gallant et al., 1992; Andersen, 1996; Chen et al., 2001a), Hamilton’s regime-switching models (Chen, 2012), and copula models (Ning and Wirjanto, 2009). However, none of these approaches are able to estimate the dependence structure of returns and volumes under the above-mentioned four different market conditions.³ Furthermore, they fail to examine whether the (tail) dependences between falling returns/rising volumes and rising returns/falling volumes under the negative dependence regime are asymmetric. Nor are they, except Ning and Wirjanto (2009), able to examine the hypothesis of asymmetric (tail) dependence under different return–volume dependence regimes. However, these pieces of information are important to investors.

This paper examines the dependence structure between stock returns and trading volumes by applying a dependence-switching copula model in which the unknown state variable switches between positive and negative return–volume dependence regimes. The paper makes three contributions to existing literature. First, our model is flexible since it allows the dependence between returns and volumes to switch between positive and negative dependence regimes. Hence, we are able to discuss the dependence structure of returns and volumes under different market conditions and to examine whether the symmetric hypothesis holds for dependence and tail dependence under different dependence regimes. Second, the unknown state variable influences parameters in both marginal distributions and copula functions. Instead of applying a two-step method, we estimate marginal distributions and copula parameters simultaneously, and hence our estimates are free from the criticism of efficiency loss. Third, we empirically investigate market driving forces that account for the time-varying, return–volume dependence.

Using daily data from 01/03/2000 to 12/31/2016 for six developed stock markets, several important results are obtained. First, the duration is much longer for the positive return–volume dependence regime than the negative dependence regime, and the volatilities of returns and volumes increase under the negative dependence regime. Second, dependence and tail dependence of stock returns and volumes are asymmetric regardless of the dependence regime being positive or negative. Third, return–volume (tail) dependence is significantly larger for downward price ticks than for upward price ticks for most countries when volumes are high relative to trend. This finding supports the view of heterogeneous investors with short-sale constraints and negative skewness in returns (Hong and Stein, 2003; Chen et al., 2001b).⁴ Finally, both the intensity of information flow and liquidity trading are important in driving the time-varying, return–volume dependence; this result agrees with Andersen (1996), Tauchen and Pitts (1983) and Li and Wu (2006).

In related literature, Ning and Wirjanto (2009) is the first paper to examine the return–volume dependence using a copula approach. They adopt a mixture of the Clayton, the survival Clayton and the Frank copulas and estimate their models by a conventional two-step estimation method.⁵ There are three restrictions in Ning and Wirjanto (2009). First, their copula functions only allow them to consider the two different market statuses under the positive or negative return–volume dependence regime.⁶ Second, their mixture copulas fail to capture the fact that return–volume dependence switches between positive and negative dependence regimes. Finally, the adoption of a two-step approach in estimation leads their estimates to suffer the criticism of efficiency loss (Rodriguez, 2007). Besides, Ning and Wirjanto (2009) focus on East Asian stock markets instead of major stock markets.

Wang et al. (2013) develop a dependence-switching copula model allowing for a state-varying dependence and then apply it to examine dynamic dependence between currency and stock markets. Our paper differs from Wang et al. (2013) in four ways. First, we investigate the dependence structure of returns and volumes for stock markets rather than the dependence structure between stock and currency markets. Second, their mixture copula is a weighted average of two copulas under a specific dependence regime, and the weight is assumed to be 0.5. However, we allow the weight to be determined by data. Third, although our dependence-switching copula model is similar to theirs, our estimation method is not. Wang et al. (2013) apply a two-step method suggested by Li (2005) in which the unknown state variable appearing in the mean and variance of the marginal model is measured by observed interest differentials. The marginal distribution is then estimated in the first step, and copula parameters, given the specified copula functions, are estimated in the second step.⁷ Instead of applying a two-step method, we estimate parameters in marginal models and the copula functions simultaneously. Finally, we investigate the market driving forces that account for the time-varying, return–volume dependence; these driving forces are not examined in Wang et al. (2013).

---

² Facing positive public information in such a case, investors may decide to hold their stocks and wait for price to go down again. This results in the rise in returns and the fall in volumes.

³ Most existing literature do not apply the copula approach to examine the relationship between returns and volumes and assume that innovations follow a symmetric multivariate normal or Student-\(t\) distribution. Hence, they fail to examine the hypothesis of symmetric dependence of returns and volume (Patton, 2006; García and Tsafack, 2011).

⁴ Hong and Stein (2003) provide a theory based on heterogeneous investors to explain that returns will be negatively skewed conditional on high trading volumes when the heterogeneous opinions among investors are large. See Section 3.3 for more details.

⁵ The two-step procedure has a cost in terms of efficiency loss since the estimation errors in the first stage result in efficiency loss in the second stage estimation.

⁶ Ning and Wirjanto (2009) find asymmetric return–volume (tail) dependence under the positive dependence regime but no (tail) dependence under the negative dependence regime. Their results indicate that market booms are associated with high trading volumes but market stress has no significant relationship with volumes. Our results under the positive dependence regime are consistent with theirs.

⁷ Wang et al. (2013) proxy the unobservable state with an instrument and estimate the parameters in marginal models with the quasi-maximum likelihood estimation method proposed by Bollerslev and Wooldridge (1992) at the first step. The copula parameters are obtained at the second step by fitting the dependence switching copula to the estimated residuals obtained from the marginal models.
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات