Asymmetric Investor Sentiment Spillovers in International Equity Markets

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Abstract

This study examines the role of the U.S. investor sentiment in affecting international equity markets at different financial market scenarios by employing multivariate multi-quantile models. We investigate market return, market volatility, and market abnormal trading volume in response to the shocks of the U.S. sentiment by individual country, economic criteria, and geographical areas. Our estimated results indicate the stronger tail cross-dependences between the U.S. sentiment and market indices at the highest quantile than those in the lowest quantile, displaying the asymmetric reactions to the shocks. We additionally find that the U.S. sentiment and volatility exhibit the strongest tail codependences. From asset allocation perspective, our findings suggest that international investors can possibly diversify their portfolio investments in different economies and geographies.

1. Introduction

Investor sentiment is one of the important characteristics in investors' decision making, which prior literature suggests that investor sentiment is negatively associated with future stock returns (Baker and Wurgler, 2006; Schmeling, 2009; and Bathia et al., 2013). Though many study the role of investor sentiment in terms of the firm level and market level, a cross country analysis is still rare.

Beckmann et al. (2011), Baker et al. (2012), and Bai (2014) suggest three possible channels, in which investor sentiment could spill over. First, if investors in one country are optimistic about investment prospects in another country, they would bid up stocks of that particular country. Second, if investors in one country are optimistic, they would increase their demands in risky assets, including international equities. Both two channels postulate that the impact of foreign sentiment on stock prices of home country arises by the purchases of foreign residents in the stock market. Third, when foreign investors are optimistic about their own economy, they might induce domestic investors to be optimistic about their local economy. Due to the linkage between the two economies, foreign sentiment affects domestic stock prices indirectly through domestic sentiment.

As sentiment drives investors' optimism and pessimism in their interpretations of the new information, investors should react differently to the market depending on the financial market conditions. We then argue that the reactions of international equity markets to the U.S. sentiment shocks are time-varying. A traditional VAR model widely used in previous literature only provides the direct estimation of the relationship at the mean of random variables. Hence, recent findings may hold at the center of the observation, but the relationship may not be symmetric across the entire conditional distribution of the dependent variable. Moreover, in setting up any structural model, a causal relationship can only be identified after maintaining the exogeneity condition of the conditioning variables (Pearl,

2014; and Heckman, 2008). In practice, however, this assumption is currently difficult to pursue because global investors can sharply adjust their positions by restructuring their portfolios, and thus affecting the global market by breaking down exogeneity requirement (Chulia et al., 2015).

To recover the impacts of such structural innovations over time, we employ the Multivariate Multi-quantile (MVMQ) model suggested by White et al. (2015) to encounter such the issue. The MVMQ model is regarded as a vector autoregressive extension to quantile models, enabling researchers to deal with the problem of exogeneity, and to directly analyze tail cross-dependence among random variables. This semi-parametric technique is also robust to outliers, imposes minimal distributional assumptions on the data generating process (DGP), and offers the flexible analysis of financial time series. In this study we aim to examine the role of the U.S. sentiment in affecting international equity markets observed through return, volatility, and trading volume, respectively. As discussed above, due to different perspectives of investors in the market, we expect that these three macro market variables react to the U.S. sentiment shocks in an asymmetric fashion, depending on their conditional distributions. In other words, the influence of the U.S. sentiment is time-varying when markets are bullish or bearish. Consequently, our argument leads to several research questions as follows. Does the U.S. sentiment spill over to international equity markets? Do international equity markets respond to the U.S. sentiment asymmetrically? Does the U.S. sentiment have a varying degree of impact on different equity markets?

Our data consists of thirty one international equity markets, and classify all observations into economic and geographical criteria. For a proxy of the U.S. sentiment, we implement Baker and Wurgler (2006) sentiment index that is widely used in recent studies. First, we estimate the relationship between the U.S. sentiment and three index variables by using the traditional VAR model to observe their relations at the center of variables. In

particular, we re-examine their relationships in accordance with related literature that mostly applies this technique. Second, we measure tail codependences between these variables by using the MVMQ model to investigate whether their relations are asymmetric. Indeed, we determine the responses of market indices at the right and left tails of distributions to the U.S. sentiment shocks.

Our study contributes to the existing literature as follows. First, we provide a larger evidence of the investor sentiment spillovers in international equity markets than appeared in prior studies. With such large number of countries, we can divide the sample into various categories to further measure tail cross-dependences in different economic and geographical criteria, enabling us to find new interesting evidence. Second, unlike most of related literature, at the aggregate level, we include return, volatility, and trading volume in the study that entirely represent market indices in the study. Hence, we can examine all dimensions of the market reactions to the shocks of sentiment. Third, the MVMQ model better complies with the global financial integrating market nowadays as investors can sharply adjust their portfolios. This new technique can deal with the problem of exogeneity that the VAR model cannot solve. Moreover, we extend recent literature by highlighting the asymmetric reactions of equity markets to the sentiment shocks that has not been documented. Finally, we strengthen behavioral finance to shed light the significant role of investor sentiment in asset pricing.

Overall, our estimated results show the statistical significant evidence of the U.S. sentiment spillovers in international equity markets, and these market indices display the asymmetric responses the U.S. sentiment shocks, depending on estimated quantiles. At the mean of the conditional distributions, their reactions are weaker than they are at both extreme financial scenarios, indicating their varying responses to the U.S. sentiment contagion. Specifically, international equity markets react more to the U.S. sentiment at the right-tail

distributions than they do so at the left-tail distributions. In other words, tail codependences between the U.S. sentiment and international equity markets are stronger when markets are bullish than they are when markets are bearish.

The rest of this paper is organized as follow. In sections 2 and 3, we illustrate measures of investor sentiment and related literature. Next, we describe methodology and data in sections 4 and 5 respectively. Finally, we provide the discussion of empirical results in section 6 and follow by concluding remarks in section 7.

2. Measures of investor sentiment

Investor sentiment is defined as a belief of investors about future cash flows or investment risks that are unjustified by the facts (Baker and Wurgler, 2007). In general, recent studies propose two common methods to proxy investor sentiment that are classified into direct and indirect sentiment measures as follow.

2.1 Direct measure of investor sentiment

The direct proxy is survey-based sentiment involving to ask people about their thoughts and expectations about stock market. Survey-based sentiment such as the Conference Board Consumer Confidence Index, The University of Michigan Consumer Sentiment Index, the American Association of Individual Investors (AAII) sentiment index, the Investors Intelligence (II) sentiment index, intends to capture the moods of investors. However, it is relatively expensive to perform a reliable survey at a high frequency, and quick questionnaires probably create less reliable answers.

2.1.1 The Conference Board Consumer Confidence Index

This survey-based sentiment started in 1967 on a bimonthly basis, and revised to release on a monthly basis in 1977. Questionnaires are sent by mails to 5,000 households designed to represent the whole U.S. households. This survey-based index is based on the approximate 3,500 respondents. Generally, the questions intend to capture the perceptions of respondents with regard to forecast their current business conditions, their current job availability, business conditions over the next six months, job availability over the next six months, and family income prospects over the next six months. The questions are listed as follow. First, how would you rate the present general business conditions in your area? Second, six months from now, do you think the business conditions in your area will be? Third, what would you say about available jobs in your area right now? Forth, six months from now, do you think there will be jobs available in your area? Fifth, how would you guess your total family income to be six months from now? The diffusion measure equals the positive response percentage divided by the sum of the positive and negative response percentages. After that, the index is computed by dividing this diffusion measure by 62.5 which is the base period. The overall index is calculated by converting each diffusion index to a base year index, and then averaging all indices together.

2.1.2 The University of Michigan Consumer Sentiment Index

The University of Michigan Consumer Sentiment Index started to publish in 1947 on a quarterly basis in the third, fifth, eighth, and eleventh months, and changed to circulate on a monthly basis in 1978. Data is collected by polls via telephone for an approximate number of 500 respondents, reflecting the entire U.S. households. In particular, the polls intend to capture the opinions of respondents on selected topics such as purchase of major household items, current financial position, the twelve-month conjecture of business conditions, and the

five-year forecast of economy prospects as well as unemployment. The following five questions are included in the polls. First, do you think now is a good time for people to buy major household items? Second, would you say that you and your family living there are better off or worse off financially than you were a year ago? Third, now turning to the business conditions in the country as a whole, do you think that during the next 12 months, I'll have good times financially or bad times or what? Forth, which would you say is more likely—that in the country as a whole I'll have continuous good times during the next 5 years or so, or that I'll have periods of widespread unemployment, or depression, or what? Finally, do you think that a year from now, you and your family living there will be financially better off, or worse off, or just about the same as now? For each question, a diffusion measure is computed by using 100 plus the difference between the percent of favorable and the percent of unfavorable replies. The University of Michigan Consumer Sentiment Index equals the level of the diffusion measure divided by the base-period level of 110, and then multiplied by 100. The overall index is calculated by averaging the diffusion indices into a composite diffusion index, and converting to a base-period index.

2.1.3 The American Association of Individual Investors (AAII) sentiment index

The AAII sentiment survey started in 1987. The AAII survey captures insight into the mood of individual investors, and currently issues on the weekly basis. This sentiment index basically measures the percentage of individual investors who are bullish, bearish, and neutral in the short term of stock markets. Each week, individuals are polled from the AAII's website, and AAII members are allowed to vote once a week during the voting period. The survey results are published in financial publications including Barron's and Bloomberg, and

are widely followed by market strategists, investment newsletter writers and other financial professionals.

2.1.4 The Investors Intelligence (II) sentiment index

The II index was introduced in 1963. Now, it is available on a weekly basis. This sentiment measure shows the outlook of independent financial market newsletter writers. The II sentiment index is viewed as a contrarian indicator because investors are advised to act oppositely to expert opinions as most advisory services follow trends. The II index directly reflects market participants' opinions. Every week, the II editor reviews about 150 newsletter writers in the market, and classifies their opinions into three criteria as follow. First, bullish denotes the percentage of the bullish advisors who recommend investors to buy stocks or forecast stock markets to rise. Second, bearish presents the proportion of advisory services that recommend to close long positions or to open short positions because markets are expected to fall. Finally, correction defines as the ratio of newsletter writers either who predict that markets become bullish, but advise investors to hold off on the purchase of stocks or who expect that markets become bearish, but view a short-term recovery in the near future.

2.2 Indirect measure of investor sentiment

The indirect measure is market-based sentiment such as the put-call ratio, volatility index, and Baker and Wurgler composite investor sentiment index that either employs financial market indicators or constructs sentiment index by using the first principal component technique. For financial market indicators, they are theoretically more accurate, but they may not an independent measure of sentiment. For example, financial market indicators may reflect the outcome of stock price movements. Using the first principal component method to form sentiment index may not be robust. As new data become

available, the sentiment composition may change, and thus the entire time series of sentiment may continuously vary over time.

2.2.1 Put-call ratio

The put-call ratio is a contrarian proxy of sentiment and equals the volume of put options divided by the volume of call options. When prices are expected to fall, investors tend to buy put options, pushing the put-call ratio to increase. Alternatively, when markets are bearish, investors buy put options either to hedge their spot positions or to speculate bearishly, resulting in the larger trading volume of put options relative to the trading volume of call options. The put-call ratio then goes up, and vice versa. A high (low) level of the put-call ratio implies a strong pessimism (optimistic) of investors.

2.2.2 Volatility Index

The well-known volatility indices are the new implied volatility of S&P 500 Index (VIX) and the new implied volatility of Nasdaq 100 (VXN) Index. First, VIX Index is mainly formed to measure the expected volatility of S&P 500 index. Chicago Board Options Exchange (CBOE) states that VIX Index includes options that represent the market's expectation of future volatility on prices over the next 30 calendar days. The expected implied volatility is computed by using the weighted average prices of S&P 500 put and call options for different strike prices. VIX Index more broadly gauge both investors' confidence and investors' fear on market movements. VIX Index is high (low) when markets are bearish (bullish). Second, VXN Index is the measure of implied volatility for Nasdaq 100 over the next 30 calendar days. It is also provided by CBOE and uses the same method as VIX Index for calculation. VXN Index reflects investors' emotions such as greed and fear towards the markets.

2.2.3 Baker and Wurgler Composite Investor Sentiment Index

Baker and Wurgler (2006) form indices by using the principal component method to extract a single sentiment measure from a wide range of relevant economic and financial data. The Baker and Wurgler (2006) composite sentiment index composes of six underling proxies for sentiment that are the closed-end fund discount (CEFD), NYSE share turnover, the average first-day returns of IPOs, the number of IPOs, the equity shares in new issues, and the dividend premium.

Baker and Wurgler (2006) argue that each existing sentiment proxy consists of not only a sentiment component, but also idiosyncratic, non-sentiment-related components. The new constructed principle component is superior to the former proxies of investor sentiment because it isolates the common sentiment component. Additionally, they form the second sentiment index that removes business cycle variation from each of the previous measures. First, they regress each of six underlying sentiment proxies on the growth in the in the industrial production index, the growth in consumer durables, nondurables, and services, and a dummy variable for NBER recessions. Next, the residuals from these regressions become cleaner proxies of sentiment.

The Baker and Wurgler sentiment index is the dominant measure in recent literature such as Yu and Yuan (2011), Baker, Wurgler, and Yuan (2012), Bathia et al. (2016). In this study, we also employ the Baker and Wurgler sentiment index as the proxy of investor sentiment. First, as this sentiment index is constructed by the first principal component that combines underlying proxies in the stock markets, it reflects sentiment as a whole and represents the collective investor sentiment of individuals. Second, unlike survey-based sentiment, as the Baker and Wurgler sentiment index is investors' belief throughout the entire stock market, it would reduce individual investor's bias. Accordingly, the Baker and Wurgler

sentiment index is suitable for our study that focuses on testing the U.S. sentiment impact on international equity markets at the aggregate market level.

3. Literature Review

In traditional finance theory, as rational investors compete to optimize their portfolio investment, their competition will result in the equilibrium of stock prices to equal the discounted value of expected cash flows. The presence of irrational investors is offset by arbitrageurs, and thus induces no significance on stock prices. As a result, due to the role of rational investors and arbitrageurs in minimizing stock mispricing, asset prices always reflect their fundamental values. However, pricing anomalies associated with non-fundamental factors still remain to leave puzzle. A number of previous studies attributed to behavioral finance have proposed the alternative explanation for stock mispricing. Recently, one significant explanation is suggested by Baker and Wurgler (2006) who show that investor sentiment significantly affects the cross-section of stock prices. At the aggregate level, to investigate the role of investor sentiment in the stock markets, researchers examine its impact on three channels that are return, volatility, and trading volume because they represent the entire markets.

3.1 Investor sentiment and stock returns

Prior literature investigates the relationship between sentiment and return and commonly finds that investor sentiment is positively (negatively) associated with contemporaneous (future) returns. When investors are overly optimistic, stock prices tend to deviate from fundamental values. Stocks tend to be overvalued during bullish markets, displaying the positive relationship between sentiment and current returns. Over longer periods, after markets correct mispricing errors, stock prices are likely to revert to their

fundamental values, exhibiting the negative relation between sentiment and future returns. At the early stage, studies are centered in the U.S. market because there are various measures of survey-based sentiment. For instance, Fisher and Statman (2000) use the AAII sentiment index and the Wall Street strategists' sentiment as the proxies of sentiment to examine its relationship with returns in the U.S. market. Their main result suggests that both two measures of sentiment are negatively related with the S&P 500 returns of the next month, but this sentiment-return relation does not hold for returns of small stocks. Later on, Fisher and Statman (2003) capture whether CCI can predict the U.S. returns, and document that high CCI is followed by low subsequent returns of S&P 500 index, NASDAQ index, and small stocks. In contrast, changes in CCI are positively associated with contemporaneous returns of S&P 500 index. Brown and Cliff (2005) suggest that investor sentiment is responsible for market pricing errors in the asset valuation model. They apply the II sentiment index as an indicator of sentiment, and exhibit that the level of market pricing errors increases with sentiment. High sentiment is subsequent by low returns in the long-run, especially at two and three years horizons, for large and growth stocks. Charoenrook (2005) employs The University of Michigan Consumer Sentiment Index to examine its explanatory power for market returns. Changes in sentiment are contemporaneously positively associated with excess market returns while they are negatively related with one-month and one-year future excess returns. Baker and Wurgler (2006) construct their composite sentiment index to explore the relationship between sentiment and cross-sectional stock returns. Their main finding indicates that when investor sentiment is high, stocks that are small, young, highly volatile, unprofitable, non-dividend paying, extreme growth, and distressed, earn relatively low subsequent returns. This is because investor sentiment has a larger impact on stocks whose valuations are highly subjective and difficult to arbitrage.

Due to a lack of survey-based sentiment, other studies outside the U.S. mostly use CCI as a measure of sentiment. For instance, Jansen and Nahuis (2003) apply CCI provided by the European Commission to investigate the short-run relationship between sentiment and stock returns for 11 European countries. Changes in sentiment are positively associated with CCI in most countries except Germany. Schmeling (2009) study the correlation between sentiment and future returns for 18 industrialized countries. High (low) investor sentiment is subsequent by low (high) stock returns of aggregate market, and value, growth and small stocks. The influence of sentiment on stock returns is more pronounced in countries with low institutional development or countries with herd-like behavior and overreaction. Examining the Australian stock market, Akhtar et al. (2011) find that after a lower CCI announcement than that of previous month, sentiment is negatively correlated with following returns. Bathia and Bredin (2013) apply a wide range of sentiment proxies that are investor survey, equity fund flow, closed-end equity fund (CEEF) discount, and equity put-call ratio to test the relationship between sentiment and market returns of G7 countries. Consistent with previous evidence, there exists a negative relation between sentiment and future equity returns. When sentiment is high (low), returns of value and growth stocks as well as returns of aggregate market are low (high). All sentiment measures in their study display stronger impact on value stock relative to growth stocks.

However, the role of investor sentiment in explaining international stock returns is relatively limited in previous studies. To my knowledge, related literature with regard to investor sentiment spillovers in international equity markets is addressed hereafter. First, Verma and Soydemir (2006) investigate the degree of the U.S. individual and institutional investor sentiments on two developed and three developing markets, and document that both types of sentiments are driven by not only rational, but also irrational factors. The results show distinctive effects of sentiment on domestic and international stock market returns.

Specifically, there is a significant positive impact of the U.S. institutional investor sentiment on the U.K., Mexico, and Brazil, but no effect on Chile. However, the U.S. individual investor sentiment only has a significant positive effect on the U.K. market. Second, Sayin and Rahman (2015) explore the influence of rational and irrational components of the U.S. institutional investor sentiment on Istanbul Stock Market (ISE) return and volatility. Their main results display that rational component of the U.S. institutional investor sentiment are positively (negatively) associated with ISE stock returns (volatility). Next, Hudson and Green (2015) determine the relationship between the U.S. sentiment and the U.K. equity returns, and both the AAII and the II sentiment indices are selected to measure the U.S. sentiment. Their findings exhibit that the U.S. sentiment is positively (negatively) related with contemporaneous (future) returns of the U.K. stocks. The U.S. institutional investor sentiment appears to be highly significant and even stronger than the U.S. individual investor sentiment does in explaining the U.K. returns for all small, medium, and large portfolios. Finally, Bathia et al. (2016) examine the extent of the U.S. sentiment spillovers on aggregate market, value and growth stock returns of other markets in G7 countries. Their empirical evidence highlights the mean responses of those markets to the U.S. sentiment shock are positive. In particular, aggregate market and growth stocks in those countries are significantly affected by the propagation of the U.S. sentiment, and value stocks become the main victim from sentiment spillovers during financial crisis.

3.2 Investor sentiment and volatility

Brown (1999) studies the implication of noise-trader theory indicating that trading activity of irrational investors depends on noise, and in turn generates a systematic risk. If noise traders have a significant effect on stock prices, such risk causes volatility. Consistent with noise-trader theory, he exhibits that unusual levels of individual investor sentiment are

correlated with greater volatility of closed-end funds. This volatility is pronounced at the open of the market and during high trading activity. Lee et al. (2002) use the II sentiment index to capture the relationship between sentiment, excess returns and market volatility in three market indices including DJIA, S&P 500, and NASDAQ. Their empirical results suggest that sentiment is a priced risk factor. Excess returns have a contemporaneous positive relation with shifts in sentiment. Likewise, bullish (bearish) changes in sentiment generate downward (upward) revisions in volatility, and higher (lower) future excess returns.

3.3 Investor sentiment and trading volume

Siganos et al. (2014) explore the relation between divergence of sentiment, and trading volume and stock price volatility. His research applies Facebook status update for 20 countries to capture sentiment divergence and finds that high sentiment divergence positively affects contemporaneous trading volume and stock price volatility. Even if Facebook status updates appear after the closing time of a particular trading day, divergence of sentiment still persists to impact trading volume and volatility on the next trading day. To examine whether stock market liquidity is related to sentiment, Liu (2015) applies the liquidity measure of Amihud (2002) and two survey-based sentiment indices in his test. He shows that higher sentiment directly increases market liquidity either by creating more noise trading or by inducing more irrational investors into the market. The Granger causality tests reveal that sentiment Granger-causes market liquidity. Moreover, he finds that higher sentiment affects higher trading volume through both direct and indirect channels. On the one hand, due to lower price impact, higher liquidity increases trading volume by producing not only larger noise trading, but also more aggressive informed trading (Baker and Stein, 2004). On the other hand, as sentiment is a determinant of overconfidence (Odean, 1998), it indirectly influences those investors to trade more, leading to an increase in trading volume.

3. Hypotheses

All of aforementioned literatures motivate us to investigate the impact of sentiment spillover on international equity markets that we believe to find new interesting evidence. In this study, we develop the hypotheses as follows.

Hypothesis 1: The U.S. sentiment asymmetrically affects international market indices.

The MVMQ model allows us to explore the impact of the U.S. sentiment on the entire conditional distributions of market indices, especially tail codependence at the extreme right and left tails. We expect that see the different reactions of return, volatility and trading volume to the U.S. sentiment.

Hypothesis 2: The effect of the U.S sentiment is stronger in right-tail distribution of market indices than that in the left-tail distribution.

Due to overly optimistic and confident of investors, the U.S. sentiment should display stronger impact on international market indices when markets are bullish than it does when markets are bearish.

Hypothesis 3: The impacts of the U.S. sentiment on international equity market are more pronounced in the developed markets than they are in the emerging markets.

Developed countries tend to have a higher magnitude of financial dependence with the U.S. market. We expect to find a stronger impact of the U.S. sentiment on indices on developed markets.

4. Methodology

We employ two models to test the relationship between the U.S. sentiment and three market index variables that are return, volatility and trading volume. First, we apply the traditional vector autoregression (VAR) model to re-examine their relation at the mean of these variables to comply with the technique widely used in previous studies. Second, we

implement the Multivariate Multi-quantile (MVMQ) model to measure tail codependences of their relation at the highest and the lowest quantiles. As the MVMQ model enables us to test the relationship between the U.S. sentiment and index variables throughout the whole conditional distributions, we perform this technique to investigate whether their relation is asymmetric. We estimate at the extreme right and left tails of distributions to explore their relationship in different financial episodes that they represent financial bubble and financial recession scenarios respectively.

4.1 The VAR Model

The VAR model of Sims (1980) is one of the most popular tools in recent literature such as Verma and Soydemir (2006), Sayin and Rahman (2015), and Bathia et al. (2016), to capture the linear interdependences between the U.S. sentiment and international equity markets over time. This multivariate time series technique is considered the suitable method because investor sentiment and stock returns may act as system (Brown and Cliff, 2004&2005; and Lee et al., 2002). Furthermore, the VAR model can measure the dynamic relationships in a relatively unconstrained way, and is good to approximate the data generating process (DGP). In principle, the VAR model generalizes the univariate autoregressive model (AR model) by allowing for more than one evolving variable. All variables in the VAR model are treated symmetrically in a structural sense even if the responses of estimated coefficients to the shocks will not generally be the same. Each variable has an equation explaining its evolution based on its own lags and the lags of other variables. Due to the delay of information transmission, another concern of the VAR model is to define the appropriate lag lengths that researchers apply the Akaike information criterion (AIC) and the Schwarz Bayesian information criterion (SBIC) to deal with it.

4.2 The MVMQ Model

The MVMQ model is the suitable technique in our study for two main reasons. First, we aim to test the asymmetric relationship between the U.S. sentiment and market index variables, especially their tail cross-dependences. Specifically, the MVMQ model is the extension to the quantile model. Due to the flexibility of the quantile regression model of Koenker and Bassett (1978), this seminal approach has increasingly gained popularity to perform in various academic disciplines such as finance, macroeconomics, and labor economics. Unlike the traditional regression method, the quantile regression model does not restrict to observe the relationship between economic variables only at the center, but it enables to analyze across the whole conditional distribution of the dependent variable (Koenker, 2005). Hence, the MVMQ model allows us to examine our first objective.

Second, the MVMQ model better complies with current conditions of equity markets because it can deal with the problem of exogeneity. In principle, to set up any structural model including the VAR model is required to ensure the exogeneity condition of the conditioning variables before identifying the causal relationships (Pearl, 2014; and Heckman 2008). However, in practice, the growing in the continuous global market integration makes it difficult to retain this assumption. As international investors can sharply adjust their positions by rebalancing their portfolios, this affects global markets to break down exogeneity requirement (Chulia et al., 2015). Even though the traditional VAR model of Sims (1980) is generally applied in time series analysis, the problem of exogeneity still remains in the estimation in the current market situation. As the alternative method, the MVMQ model can recover the impact of these specific structural innovations in financial markets over times.

In principle, White et al. (2015) propose the MVMQ model, which is a multivariate extension of the Conditional Autoregressive Value at Risk (CAViaR) model of Engle and Maganelli (2004). The MVMQ model is viewed as a vector autoregressive (VAR) extension

to quantile models, and its superiority is to allow directly measuring the degree of tail codependences among a set of random variables. Although the MVMQ model's setting is adopted from a traditional quantile regression, it is robust to outliers in analyzing financial time series. As the semi-parametric technique, the MVMQ model imposes minimal distributional assumptions on the underlying data generating process (DGP), and therefore offers a greater flexibility in analyzing different market scenarios. While lower quantiles are potentially associated with bearish markets, higher quantiles are intuitively associated with bullish markets. Very high or very low quantiles can relate to different financial phenomena, such as financial bubble, financial contagion, and financial distress. Within the framework of cross-national spillovers, the concerns of reverse causality, simultaneous equations, omitted variables, and endogenous regressors, also need to be identified before quantifying the relationships between variables at different quantiles of the distribution. Such restrictions can be imposed in the multivariate quantile setting. The main concept of the MVMQ model is that quantiles of the distribution of a time series depend on its own lags, and on the lags of interested covariates. In this study, we follow White et al. (2015) to employ the MVMQ (1,1) model and its specification is presented below.

$$q_{Sent} = c_1(\theta) + a_{11}(\theta)Sent_{t-1} + a_{12}(\theta)Y_{t-1} + b_{11}(\theta)q_{Sent\,t-1} + b_{12}(\theta)q_{Y_{t-1}}, \quad (1)$$

$$q_Y = c_1(\theta) + a_{21}(\theta)Sent_{t-1} + a_{22}(\theta)Y_{t-1} + b_{21}(\theta)q_{Sent\,t-1} + b_{22}(\theta)q_{Y_{t-1}'} \quad (2)$$

or more compactly by:

$$\boldsymbol{q_{i,t}} = c + A\,\boldsymbol{Y_{i,t-1}} + B\,\boldsymbol{q_{i,t-1}}\,,$$

where $q_{i,t}$ is the matrices of the level θ quantiles of the U.S. sentiment index and stock return, or the U.S. sentiment index and volatility, or the U.S. sentiment index and trading volume, respectively. Put differently, the quantiles of dependent variables rely on their first own lag, $Y_{i,t-1}$, via matrices A, and on the first lag of quantiles, $q_{i,t-1}$, in the bivariate system via matrices B. In the bivariate elements, the main diagonals of matrices B measure the

dependence of quantiles on their own lags whereas the off-diagonals measure the tail codependence between the quantile series.

5. Data

Daily price indices and trading volumes are from DataStream. The sample study period starts from 1 January 1998 to 31 December 2014. We exclude countries that display too high standard errors to eliminate outliers. At the end of this process, our sample was left with 31 international price indices that include Australia (AUS), Brazil (BRA), Canada (CAN), Chile (CHILE), China (CHN), Colombia (COL), Denmark (DEN), Finland (FIN), France (FRA), Germany (GER), Hungary (HUN), Iceland (ICELAND), India (INDIA), Indonesia (INDO), Ireland (IRELAND), Israel (ISRAEL), Italy (ITA), Japan (JAP), Korea (KOR), Malaysia (MALAY), Mexico (MEX), Netherland (NET), Pakistan (PAKI), Peru (PERU), Portugal (POR), Sweden (SWE), Switzerland (SWISS), Taiwan (TAIWAN), Thailand (THA), the U.K. (UK) and the U.S. (US). However, due to the data availability of trading volumes, after deleting outliers our sample was left with 13 countries that include Canada, China, India, Indonesia, Japan, Korea, Malaysia, Mexico, Pakistan, Sweden, Taiwan, Thailand and the U.K..

5.1 Return

We compute return by converting price index to a continuously compounded logarithmic return.

5.2 The volatility model

We estimate the conditional variance using a rolling window model suggested by French, Schwert, and Stambaugh (1987) as follows.

$$Var_t(R_{t+1}) = \sigma_t{}^2 = \frac{1}{22}\sum_{t=1}^{N} r_t^2$$

where r_t is the demeaned daily return in month m.[1] 22 is an approximate number of trading days in each month.

5.3 Abnormal trading volume

The abnormal trading volume ($ATV_{i,t}$) suggested by Takeda and Wakao (2014) is defined as follows.

$$ATV_t = \frac{TV_t - TV_{avg}}{TV_{avg}}$$

where $TV_{avg} = \frac{\sum_{t=1}^{L} TV_t}{t}$. t is the period of our examination which is 4435 days to examine the relationship between the U.S. sentiment and trading volume.

For the U.S. sentiment index, we employ the Baker and Wurgler (2006) sentiment index available in monthly frequency in their website. As underlying proxies incorporated to construct the Baker and Wurgler (2006) sentiment index change very slowly during a particular month, we assume to use it on a daily basis.

6. Empirical Results

The time series estimation of different quantiles provides the evidence to support our motivation in examining the responses of international equity markets to the shocks originating from the U.S. sentiment. Responses of international equity markets are expected to differ across countries, depending on financial market periods, economic conditions, and geographical areas. Specifically, the main result highlights the asymmetrical responses of aggregate equity markets to the U.S. sentiment shocks. Implementing the multivariate multi-

[1] The daily demeaned return is calculated by the within-month mean return subtracting from the daily raw return.

quantile (MVMQ) model, our study is able to explore their reactions to the U.S. sentiment in a varying degree of quantiles, especially in very extreme cases. The asymmetrical reactions of international equity markets are observed through three market index distributions that are return, volatility and trading volume.

In this section, we test the hypotheses of the statistical dependence between the U.S. sentiment and stock market activities in 31 countries. First, we introduce the estimated results of the traditional VAR model, representing the direct estimation of the relationships at the mean of variables. Moreover, as the VAR model is widely estimated to test the relationship between investor sentiment and stock market in previous studies, our estimated results from this method can re-examine the existing evidence. Second, we report the estimated results of the MVMQ (1,1) model at two different quantiles, showing those relations over time at the extreme right and left tails of conditional distributions.

6.1 The VAR Model

Tables 1, 2, and 3 demonstrate the estimated coefficients of the relationships between the U.S. sentiment and return, the U.S. sentiment and volatility, and the U.S. sentiment and trading volume using the VAR model for 31 international equity markets. We categorize the country sample based on economic characteristics according to the definition of the International Monetary Fund (IMF), which consists of 19 developed countries (Panel A) and 12 emerging countries (Panel B). As mentioned above, the estimated results from such specification provide the relationship evidence between each pair at the mean of interested variables. Regarding to the statistics in Tables 1 and 2, the U.S. sentiment affects more on return and volatility of the developed countries than on those of the emerging markets. A closer look into each individual country shows that 10 out of 19 developed countries are statistically significant in the relationship between the U.S. sentiment and return while 9 out

of them are statistically significant in the association between the U.S. sentiment and return. However, there is a fewer number of the emerging countries that exhibit the statistical significance in the relationship between the U.S. sentiment, and return and volatility. In particular, 3 out of 12 emerging countries such as Hungary, India, and Indonesia are statistically significant for the relationship between the U.S. sentiment and return while only India remains significant for the relationship between the U.S. sentiment and volatility. As a consequence, the U.S. sentiment has stronger impacts on developed markets than on emerging markets. Furthermore, in Table 3, the effects of the U.S. sentiment on trading volume seem to be indifferent between developed and emerging groups, since almost all countries expect the U.K. (Indonesia) are statistically significant in panel A (panel B). However, the autoregressive coefficients at the mean values of their own lags are insignificant in many countries.

[INSERT TABLE 1]

[INSERT TABLE 2]

[INSERT TABLE 3]

Another interesting result from the VAR estimation is that in all cases of the statistical significant coefficients, the U.S. sentiment is negatively associated with lagged return, lagged volatility, and lag trading volume. Our estimated results are consistent with recent literatures that find the negative relationship between various proxies of investor sentiment, and future stock returns in a particular country. For instance, Baker and Wurgler (2006) form their sentiment composite index and use monthly data in the U.S. market to study whether investor sentiment affects the cross-section of stock returns. Their finding suggests that investor sentiment has larger effects on stocks that are difficult to value and arbitrage. In particular, young, small, unprofitable, non-dividend-paying, high volatility, extreme growth and distressed stocks tend to earn relatively low subsequent returns during high sentiment.

Second, Bathia and Bredin (2013) examine the effects of investor sentiment on value and growth stock returns as well as aggregate market returns of G7 countries by using different sentiment measures. Their finding display that consumer confidence index, equity fund flow, closed-end equity fund (CEEF) discount, and equity put–call ratio are negatively related with future returns. Their findings are consistent with the adaptive expectation hypothesis in explaining the investors' behavior. Previous studies commonly have shown that value stocks outperform growth stocks, and thus when sentiment is high, investors tend to overweight on value stocks in their portfolios to expect that such stocks would continue to yield positive returns. Investor optimism is then followed by an increase in demand of value stocks and then put pressure on their prices to rise. However, after the period of high sentiment has passed, value stock prices would decline in subsequent months and return to the valuation levels. Moreover, Fisher and Statman (2003) use the consumer confidence measures provided by the University of Michigan and the Conference Board to test whether investor sentiment can predict stock return. Using monthly data of the U.S. market, they find that high consumer confidence is generally followed by low returns. In addition, Brown and Cliff (2005) explore whether high current sentiment is followed by low cumulative long-run returns as the market price reverts to its intrinsic value. High levels of sentiment result in significantly lower returns over the next 2 or 3 years, and this effect holds for the aggregate stock market, concentrating on large-capitalization growth stocks. Overly optimistic (pessimistic) investors drive prices above (below) fundamental values, and these pricing errors tend to revert over a multi-year horizon.

6.2 The MVMQ (1,1) Model

Tables 4, 5 and 6 provide the results of the estimated coefficients at two different quantiles that are $\theta = 0.01$ and $\theta = 0.99$ for 31 international markets. The MVMQ (1,1) model

composes of two main specifications in which they can be estimated independently from each other. The dependent variable of equation (1) is the quantile of the U.S. sentiment, and that of equation (2) is the quantile of index variables. Indeed, as this study focuses on exploring the responses of aggregate equity markets to the U.S. sentiment shocks, equation (2) directly illustrates the impacts of the U.S. sentiment on each variable of market indices. Hence, the estimated coefficients from this equation are reported at two different quantiles of the distributions of returns, volatility and trading volume in Tables 4, 5, and 6 respectively.

The estimated results in each table also present the joint statistical significant tests of the non-diagonal coefficients in the matrices A and B. The joint null hypothesis is that all off-diagonal coefficients of both matrices are equal to zero. Specifically, the coefficients outside the main diagonal in these matrices represent the measure of cross-dependence between the two random variables.

[INSERT TABLE 4]

[INSERT TABLE 5]

[INSERT TABLE 6]

From Tables 4, 5, and 6, the joint tests of cross-dependence among the U.S. sentiment, and returns, volatility and trading volume exhibit the following results. First, the codependence tests of the relationship between the U.S. sentiment and index returns show that almost all countries except Korea are statistically significant in the right-tail while only 28 out of 31 countries are in the left-tail. The statistical insignificant joint tests of those emerging countries are Brazil, India, and Pakistan. Second, the tests of cross-dependence between the U.S. sentiment and volatility display that almost all countries except Finland are statistically significant at $\theta = 0.99$ whereas only 28 out of 31 countries are at $\theta = 0.01$. Those emerging countries in which their results are insignificant in the joint tests are Colombia, India, and Malaysia. Finally, the joint tests of the relation between the U.S. sentiment and

trading volume show that all countries are statistically significant in the highest quantile, whilst 11 out of 13 countries are in the lowest quantile, in which Japan and Pakistan are insignificant.

Overall, the evidence of the joint tests indicates that shocks experienced by the U.S. sentiment influence the tails of return, volatility, and trading volume distributions on international equity markets in an asymmetric pattern, supporting our prediction in the first hypothesis. Taking the statistic joint tests into account, tail-codependences tend to be more significant in the highest quantile than they are in the lowest quantile. In other words, the impacts of the U.S. sentiment on returns, volatility and trading volume in international countries are stronger, when the markets are bullish than those when the markets are bearish, supporting our prediction in the second hypothesis.

Based on the economic classification, the relationships between the U.S. sentiment, and index return and volatility appear that 18 out of 19 developed countries show cross-dependences at $\theta = 0.99$ while all of them do so at $\theta = 0.01$. In the case of emerging markets, although all of them present codependences in the right-tail, only 9 out of 12 countries do so in the left-tail. Regardless of quantiles, a closer look at b_{21} uncovers that 8 countries show cross-tail-dependence between US sentiment and volatility, but only Netherland and Thailand do so between US sentiment and return.

For the relation between the U.S. sentiment and trading volume, all 6 developed markets are statistically significant in the highest quantile whereas 5 out them are in the lowest quantile. In the case of emerging markets, even though all 7 countries are statistically significant in the right-tail, 6 out them are the left-tail. It is noted that only Japan is insignificant for the developed group, and Pakistan is for the emerging group in the lowest quantile. The estimated coefficients of b_{21} in China, Japan, Sweden, and Thailand reveal the bivariate distributions between the U.S. sentiment and trading volume captured by the

MVMQ (1,1) model. The significant tail-codependences of b_{21} propose that trading volume of China responds to US sentiment well at very positive and negative extreme cases.

Taking the statistic joint tests into account, at $\theta = 0.99$ ($\theta = 0.01$), on the one hand, the spillover effects of the U.S. sentiment on international index return (volatility) tend to be stronger in the emerging (developed) countries than those in the developed (emerging) markets. On the other hand, the spillover impact of the U.S. sentiment on trading volume seem to be indifferent since all countries in each group exhibit tail-codependence at $\theta = 0.99$, and there is one country in each group that is not significant at $\theta = 0.01$. Our finding is consistent with Bathia et al. (2016), who suggest that the U.S. investor sentiment could play the role of global risk factor, and its significance has implications for international asset pricing models. They investigate the extent of spillovers from the U.S. investor sentiment on other G7 aggregate markets, value and growth stock returns and document the significant spillover evidence of the U.S. investor sentiment on those stock returns. As the joint tests of G7 countries in this study are statistically significant at 1% level for both quantiles, our paper also finds the strong evidence of the U.S. sentiment spillovers on G7 equity returns.

Due to the data availability of market indices between 1998 and 2014, a total number of countries that can be divided into each economic group are not equal. Specifically, there are a larger number of countries in the developed group with 19 markets than those in the emerging group with 12 markets. Thus, for the MVMQ (1,1) model, it seems to be unclear to define whether each market type is more strongly impacted by the U.S. sentiment to support our anticipation in the third hypothesis. To re-examine the results in Tables 4, 5 and 6, we then estimate the average responses of international equity markets to the shocks originating from the U.S. sentiment.

6.2.1 The relationship between the U.S. sentiment and international equity markets averaged by economic criterion using the MVMQ (1,1) model

Tables 7, 8, and 9 report the average reactions of market indices to the U.S. sentiment classified by not only economy, but also geography. Classified by geographical criterion, the total number of markets can be divided into 11 Asia Pacific (AP), 5 Latin American (LA), 2 North American (NA), and 13 European (EU) countries.

[INSERT TABLE 7]

[INSERT TABLE 8]

[INSERT TABLE 9]

On average, the null hypothesis joint tests are statistically significant in both quantiles for almost all economic and geographical criteria. Taking the statistic joint tests into account, these estimated results support the strong evidence of tail-codependence between the U.S. sentiment and international equity markets. In particular, only cross-dependence between the U.S. sentiment and trading volume for the emerging group becomes insignificant. First, in both quantiles, the developed markets exhibit stronger tail-codependences between the U.S. sentiment and return than the emerging markets do so. The possible reason may be due to a higher degree of financial dependence between the U.S. and the developed markets. Our finding is consistent with Verma and Soydemir (2006), who investigate the degree to which the U.S. individual and institutional investor sentiments are propagated abroad. Their study includes two developed economies (the U.S. and the U.K.), and three developing South American economies (Brazil, Mexico, and Chile). They assert that the U.S. institutional investor sentiments have varying degrees of impact on the equity markets of the U.K., Mexico, and Brazil, but no effect on Chile. Additionally, they stress that the U.S. individual investor sentiment effect is statistically significant only for the U.K., which is a representative of the developed markets. As the U.K. is substantially affected by both types of the U.S.

investor sentiment, it suggests that the U.S. sentiment have stronger influence on developed markets than on emerging markets in which their findings are consistent with ours. Similarly, Chulia et al. (2015) study return spillovers from the U.S. to Latin American and G7 stock markets, and find that stronger tail-codependences between the U.S. and the mature markets than those between the U.S. and the emerging markets. However, to include a large weight of portfolio investment on developed countries, a majority of international investors' portfolios tend to move along with the U.S. market, making it difficult to exploit excessive profit from market timing abilities.

Second, for the relationship between the U.S. sentiment and volatility, the evidence of cross-tail-dependence is stronger in the emerging (developed) countries than that in the developed ones at $\theta = 0.99$ ($\theta = 0.01$). It appears that the emerging (developed) regions are more sensitive to the U.S. sentiment when markets are bullish (bearish). Despite the high level of volatility in emerging countries themselves, to invest in these areas, international investors may need to monitor the U.S. sentiment more closely during financial bubble periods. At $\theta = 0.01$ which is a very low quantile, considered Value at Risk (VaR) statistics, as the developed countries have a higher degree of financial dependence with the U.S., it also induces the higher level of contagion from the U.S. sentiment to index volatility during financial crises. As a result, during this financial instability periods, international investors can diversity their portfolio investment through the emerging regions since there is a weaker movement between the U.S. sentiment and index volatility in such areas than that in developed areas. The interesting results are shown at $\theta = 0.99$ that all estimated coefficients are statistically significant at 1% level for both developed and emerging markets. Their estimated coefficients of b_{21} in both quantiles record the strong evidence of cross-tail-dependence for the right-tail of the marginal volatility distributions. In other words, this

dependence extends to the bivariate distribution in the right-tail for both economic types, and in the left-tail for the emerging markets.

Third, for codependence between the U.S. sentiment and trading volume, only the joint test of the developed markets is statistically significant at $\theta = 0.99$, but it is not for the emerging markets. At $\theta = 0.01$, even if both economic types show the statistical significance at 1% level, the influences of the U.S. sentiment on trading volume in the emerging markets are stronger than those in the developed countries. The estimated coefficient of b_{21} in the lowest quantile suggests that this dependence extends to the bivariate distribution in the left-tail for the emerging markets. At 1% VaR during financial crises, the higher movement between the U.S. sentiment and trading volume in the emerging regions indicates that the U.S. sentiment becomes the important signal for investors' decision to trade in equity markets. On average, taking the statistic joint tests into account, we find that there is the stronger evidence of tail cross-dependence between the U.S. sentiment and return as well as between the U.S. sentiment and trading volume in the developed markets than that in the emerging markets at the right-tail distribution. However, the stronger evidence of tail cross-dependence appears between the U.S. sentiment and return as well as between the U.S. sentiment and volatility in the developed markets than that in the emerging markets at the left-tail distribution. The estimated results in this subsection are consistent with our third hypothesis, supporting that the mature markets are stronger influenced by the U.S. sentiment.

6.2.2 The relationship between the U.S. sentiment and international equity markets averaged by geographical criterion using the MVMQ (1,1) model

Based on the geographical criteria, even though the joint tests of cross-dependence between the U.S. sentiment and return are statistically significant at 1% level, Latin American countries display the strongest tail-codependence among all areas in the right-tail whilst

European countries do so in the left-tail. In other words, when markets are bullish, the U.S. sentiment exhibits the strongest impact on return of Latin American nations. Meanwhile, at 1% VaR, when markets are bearish, it shows the highest contagion effect on return of European regions. Hence, to diversify portfolio investment, international investors should allocate to invest in geographical zones that do not dramatically move together with the U.S. (and the global).

Next, the null hypothesis joint tests of codependence between the U.S. sentiment and volatility are also statistically significant at 1% level for all geographical areas. Asia Pacific markets show the strongest evidence among all groups at $\theta = 0.99$ whereas European markets do so at $\theta = 0.01$. The estimated coefficients of b_{21} are also statistically significant at 1% level in Asia Pacific, Latin American, and European countries in the highest quantile while they are in North America and European countries in the lowest quantile. These results strengthen not only the distinctive reliance between the tails of the marginal volatility distributions, but also the extension of the bivariate distribution.

Lastly, Latin American markets display the strongest cross-dependence between the U.S. sentiment and trading volume in both bullish and bearish periods. Put differently, trading volume in Latin American countries drastically depends on the U.S. sentiment during the financial extreme episodes. The U.S. sentiment has the least effect on trading volume in Asia Pacific (European) countries among all areas during financial booming (recession).

7. Conclusions

This study examines international main equity markets in response to the U.S. sentiment shock, in which their reactions are observed through return, volatility and trading volume. The U.S. market is regarded as the global risk factor, and thus exploring its sentiment spillover can benefit not only international financial investments, but also risk

contagion. By employing the MVMQ model, it allows us to investigate the responses of market indices at different quantiles, revealing the new evidence of sentiment spillover in different financial scenarios. Our main finding is that international equity markets respond asymmetrically to the U.S. sentiment shock, depending on quantiles investigated. At the mean of the distributions, their reactions are weaker than they are at the extreme cases, highlighting their varying degree of the responses to the U.S. sentiment spillovers. Those market indices react more to the U.S. sentiment in the highest quantile ($\theta = 0.99$) than they do so in the lowest quantile ($\theta = 0.01$). Put differently, there is stronger impact of the U.S. sentiment on international equity markets when markets are bullish than that when markets are bearish. The possible explanation is that this investors' behavior follows the adaptive expectation hypothesis. During bullish markets, as investors are overly optimistic, they invest more on equity markets, expecting stocks would continue to yield positive returns. Bullish markets are then subsequent by an increment in stock demand, putting on price pressure to go up.

On average, based on the economic criterion, the reactions of developed countries' return to the U.S. sentiment shock are stronger than those of emerging markets' return in both quantiles. For the geographical criterion, the U.S. sentiment has the strongest impact on return of Latin American (European) countries during bullish (bearish) markets. Unlike reactions of return to the U.S. sentiment shock, those of volatility of the emerging (developed) markets are stronger than those of developed (emerging) markets at $\theta = 0.99$ ($\theta = 0.01$). At the right-tail distribution, there is the strong evidence of negative tail codependence between the U.S. sentiment and return for Asia Pacific, Latin American, and Europeans areas. At the left-tail, North American and European areas extend to the bivariate distribution. The evidence of tail cross-dependences are significantly negative (positive) for North American (European) countries. At 1% Value at Risk (VaR) analysis, return and volatility of the mature

markets react more to the U.S. sentiment shock than those of emerging markets, suggesting the higher degree of financial dependence between the U.S. market and mature countries during financial recession.

Finally, there is the strongest reaction of trading volume to the U.S. sentiment shock for developed (emerging) markets in the highest (lowest) quantile. For international diversification purpose, to exploit equity investments following the U.S. sentiment shock, Latin American countries are the best destinations for international investors who need to pursue the highest return following the U.S. sentiment shock during financial booming. However, international investors who invest in European markets during financial distress should monitor the U.S. sentiment closely since the U.S sentiment has the strongest impact on these regions. Asia Pacific regions are the most sensitive areas following the U.S. sentiment shock during financial bubble while European countries are during financial recession. Furthermore, Latin American markets exhibit the most sensitivity in term of their trading volume after the U.S. sentiment shock in both financial extreme episodes. Applying our empirical results, international investors can select their most suitable investment strategies in equity markets with respect to global sentiment shock.

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Table 1

The U.S. sentiment and return estimated by the VAR model

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the traditional VAR model and represent the estimation of the relationship between the U.S. sentiment and return at the mean of the return distribution. The dependent variable is return of 31 international equity markets. The independent variables are the lag of the U.S. sentiment and the lag of return.

Dependent Variables	Independent Variables		
Return $_{t}$	Constant	US Sentiment $_{t-1}$	Return $_{t-1}$
PANEL A: Developed Countries			
AUS	0.0177	-0.0031	-0.0227
	0.0152	*0.0214*	*0.0150*
CAN	0.0266	-0.0523**	-0.0049
	0.0176	*0.0247*	*0.0150*
DEN	0.0347*	-0.0436*	0.0419***
	0.0197	*0.0276*	*0.0150*
FIN	0.0352	-0.0945**	0.0104
	0.0291	*0.0408*	*0.0150*
FRA	0.0172	-0.0529*	-0.0207
	0.0229	*0.0322*	*0.0150*
GER	0.0290	-0.0585*	-0.0072
	0.0238	*0.0335*	*0.0150*
ICELAND	-0.0006	-0.0025	0.0203
	0.0304	*0.0426*	*0.0150*
IRELAND	0.0070	-0.0096	0.0567***
	0.0213	*0.0299*	*0.0150*
ISRAEL	0.0426	-0.0635**	0.0479**
	0.0189	*0.0265*	*0.0150*
ITA	0.0022	-0.0464	-0.0094
	0.0239	*0.0335*	*0.0150*
JAP	0.0128	-0.0519*	0.0249*
	0.0210	*0.0295*	*0.0150*
KOR	0.0394	-0.0238	0.0370**
	0.0276	*0.0388*	*0.0150*
NET	0.0081	-0.0443	0.0007
	0.0229	*0.0321*	*0.0150*
POR	-0.0056	-0.0397	0.0979***
	0.0188	*0.0264*	*0.0149*
SWE	0.0369	-0.0964***	-0.0157
	0.0239	*0.0336*	*0.0150*
SWISS	0.0134	-0.0322	0.0299**
	0.0188	*0.0264*	*0.0150*
TAIWAN	0.0127	-0.0583*	0.0388***
	0.0223	*0.0312*	*0.0150*
UK	0.0121	-0.0378	0.0286*
	0.0188	*0.0264*	*0.0150*
US	0.0271	-0.0514*	-0.0771***
	0.0193	*0.0271*	*0.0150*

Dependent Variables	Independent Variables		
Return $_{t}$	Constant	US Sentiment $_{t-1}$	Return $_{t-1}$
PANEL B: Emerging Countries			
BRA	0.0416	-0.0470	0.0256*
	0.0288	*0.0404*	*0.0150*
CHILE	0.0283**	-0.0247	0.2212***
	0.0117	*0.0165*	*0.0146*
CHN	0.0239	-0.0095	0.0031
	0.0234	*0.0329*	*0.0150*
COL	0.0476**	-0.0398	0.1825***
	0.0208	*0.0292*	*0.0148*
HUN	0.0234	0.0468***	-0.0452
	0.0263	*0.0150*	*0.0370*
INDIA	0.0631***	0.0902***	0.0813***
	0.0243	*0.0341*	*0.0150*
INDO	0.0271	-0.0514*	-0.0771***
	0.0193	*0.0271*	*0.0150*
MALAY	0.0305	-0.0393	0.0246
	0.0195	*0.0274*	*0.0150*
MEX	0.0503**	-0.0416	0.0924***
	0.0223	*0.0313*	*0.0150*
PAKI	0.0659***	-0.0334	0.0826***
	0.0238	*0.0334*	*0.0150*
PERU	0.0477**	-0.0472	0.1669***
	0.0212	*0.0297*	*0.0148*
THA	0.0363	-0.0389	0.0535***
	0.0240	*0.0337*	*0.0150*

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level.

Table 2

The U.S. sentiment and volatility estimated by the VAR model

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the traditional VAR model and represent the estimation of the relationship between the U.S. sentiment and volatility at the mean of the volatility distribution. The dependent variable is return of 31 international equity markets. The independent variables are the lag of the U.S. sentiment and the lag of volatility.

Dependent Variables	Independent Variables		
Volatility $_{t}$	Constant	US Sentiment $_{t-1}$	Volatility $_{t-1}$
PANEL A: Developed Countries			
AUS	0.0176	-0.0033	-0.0233
	0.0152	*0.0213*	*0.0150*
CAN	0.0266	-0.0525**	-0.0072
	0.0176	*0.0247*	*0.0151*
DEN	0.0343*	-0.0440	0.0418***
	0.0197	*0.0276*	*0.0150*
FIN	0.0335	-0.0963**	0.0091
	0.0291	*0.0409*	*0.0151*
FRA	0.0160	-0.0541*	-0.0222
	0.0230	*0.0323*	*0.0150*
GER	0.0281	-0.0595*	-0.0084
	0.0239	*0.0335*	*0.0151*
ICELAND	0.0001	-0.0018	0.0203
	0.0305	*0.0427*	*0.0151*
IRELAND	0.0056	-0.0109	0.0560***
	0.0213	*0.0299*	*0.0150*
ISRAEL	0.0441**	0.0621**	0.0463***
	0.0189	*0.0265*	*0.0150*
ITA	-0.0002	-0.0487	-0.0097
	0.0239	*0.0336*	*0.0150*
JAP	0.0113	-0.0535*	0.0227
	0.0210	*0.0295*	*0.0150*
KOR	0.0320	-0.0309	0.0383**
	0.0273	*0.0383*	*0.0150*
NET	0.0071	-0.0452	0.0001
	0.0229	*0.0321*	*0.0150*
POR	-0.0080	-0.0421	0.0961***
	0.0188	*0.0264*	*0.0150*
SWE	0.0360	-0.0976***	-0.0180
	0.0240	*0.0336*	*0.0151*
SWISS	0.0124	-0.0331	0.0298**
	0.0189	*0.0264*	*0.0150*
TAIWAN	0.0129	-0.0582*	0.0384**
	0.0223	*0.0313*	*0.0150*
UK	0.0109	-0.0390	-0.0303**
	0.0189	*0.0265*	*0.0150*
US	0.0268	-0.0517*	-0.0776***
	0.0194	*0.0271*	*0.0150*

Dependent Variables	Independent Variables		
Volatility $_{t}$	Constant	US Sentiment $_{t-1}$	Volatility $_{t-1}$
PANEL B: Emerging Countries			
BRA	0.0430	-0.0457	0.0247
	0.0288	*0.0403*	*0.0150*
CHILE	0.0300**	-0.0233	0.2167***
	0.0118	*0.0164*	*0.0147*
CHN	0.0234	-0.0099	0.0034
	0.0235	*0.0329*	*0.0151*
COL	0.0481**	-0.0394	0.1810***
	0.0209	*0.0292*	*0.0148*
HUN	0.0248	-0.0438	0.0480***
	0.0263	*0.0368*	*0.0150*
INDIA	0.0656***	-0.0880***	0.0798***
	0.0244	*0.0341*	*0.0151*
INDO	0.0560**	-0.0506	0.1176***
	0.0239	*0.0335*	*0.0149*
MALAY	0.0317*	-0.0389	0.0145
	0.0192	*0.0269*	*0.0151*
MEX	0.0527**	-0.0392	0.0926***
	0.0223	*0.0312*	*0.0150*
PAKI	0.0672***	-0.0316	0.0874***
	0.0237	*0.0333*	*0.0150*
PERU	0.0493**	-0.0456	0.1661***
	0.0213	*0.0298*	*0.0148*
THA	0.0311	-0.0442	0.0490***
	0.0237	*0.0333*	*0.0150*

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level.

Table 3

The U.S. sentiment and trading volume estimated by the VAR model

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the traditional VAR model and represent the estimation of the relationship between the U.S. sentiment and volatility at the mean of the trading volume distribution. The dependent variable is return of 13 international equity markets. The independent variables are the lag of the U.S. sentiment and the lag of trading volume.

Dependent Variables	Independent Variables		
Trading Volume $_{t}$	Constant	US Sentiment $_{t-1}$	Trading Volume $_{t-1}$
PANEL A: Developed Countries			
CAN	0.0069	-0.0399***	0.7630***
	0.0045	*0.0065*	*0.0097*
JAP	0.0036	-0.0199***	0.9147***
	0.0033	*0.0048*	*0.0060*
KOR	0.0053	-0.0302***	0.5988***
	0.0078	*0.0110*	*0.0120*
SWE	0.0050	-0.0288**	0.7103***
	0.0084	*0.0118*	*0.0106*
TAIWAN	0.0041	-0.0235***	0.8699***
	0.0028	*0.0042*	*0.0074*
UK	*-0.0005*	*0.0027*	*0.8442****
	0.0038	*0.0053*	*0.0081*
PANEL B: Emerging Countries			
CHN	0.0043	-0.0158**	0.9676***
	0.0045	*0.0065*	*0.0039*
INDIA	0.0052	-0.0286***	0.9342***
	0.0037	*0.0057*	*0.0053*
INDO	0.1409	-0.8268	0.0010
	0.3685	*0.5174*	*0.0150*
MALAY	0.0061	-0.0345***	0.8673***
	0.0059	*0.0084*	*0.0075*
MEX	0.0118	-0.0683***	0.7349***
	0.0077	*0.0112*	*0.0102*
PAKI	0.0040	-0.0225**	0.8393***
	0.0062	*0.0088*	*0.0082*
THA	0.0061	-0.0338***	0.9120***
	0.0076	*0.0109*	*0.0062*

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level.

Table 4

The U.S. sentiment and return estimated by the MVMQ (1,1) model at 1st and 99th quantiles for individual country

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the MVMQ (1,1) model and represent the estimation of the relationship between the U.S. sentiment and return at the left- and right-tail of the return distribution respectively. This table only reports coefficients associated with equation (2) because this study concentrates on measuring the responses of international equity markets to the U.S. sentiment shock. The dependent variable is quantile of return for 31 international equity markets. The independent variables are the lag of the U.S. sentiment, the lag of quantile of the U.S. sentiment, the lag of return, and the lag of quantile return respectively.

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL A: Developed Countries							PANEL A: Developed Countries					
AUS	-0.0451	-0.0057	-0.2127***	-0.0044	0.9169***	42.1661***	0.0416	0.0041	0.2383	-0.0018	0.8981	26.1648***
	0.2534	*6.8107*	*0.0438*	*7.2862*	*0.0677*		*3.1590*	*122.9373*	*0.3289*	*114.8169*	*0.8186*	
CAN	-0.0550	-0.0170	-0.2652	-0.0112	0.9068***	60.3170***	0.0159	0.0077	0.2300***	0.0010	0.9164***	50.6116***
	0.7261	*26.8505*	*0.3805*	*12.3029*	*0.1042*		*0.0324*	*3.1343*	*0.0235*	*2.8842*	*0.0106*	
DEN	-0.1726***	-0.0670	-0.3185**	-0.0802	0.8513***	28.2062***	0.0129	-0.0010	0.1147***	0.0021	0.9587***	10.1384**
	0.0462	*0.9436*	*0.1531*	*0.9664*	*0.0371*		*0.0851*	*1.9991*	*0.0127*	*1.8965*	*0.0191*	
FIN	-0.0317	-0.0108	-0.1435	-0.0159	0.9497***	9.1622*	0.0178	0.0087	0.1539	0.0023	0.9456***	16.1820***
	0.2419	*4.0492*	*0.1266*	*4.3408*	*0.0372*		0.1754	15.2761	0.2174	13.6436	0.1396	
FRA	-0.1351	0.0002	-0.2645	-0.0099	0.8815***	24.9761***	0.0141	-0.0009	0.2603	-0.0326	0.9178*	23.6066***
	0.3796	*16.9938*	*0.3934*	*18.0037*	*0.2849*		2.2489	45.5283	3.0411	43.3388	0.5152	
GER	-0.1692***	0.0072	-0.2985***	-0.0105	0.8643***	149.4783***	0.0293**	- 0.0046	0.2357	-0.0192	0.9186***	32.8139***
	0.0628	*10.9545*	*0.0927*	*11.4071*	*0.1337*		0.0123	0.3385	0.1433	0.3209	0.0395	
ICELEND	-0.0050	-0.0130	-0.2642	0.0139	0.9242***	131.0086***	0.0285***	0.0004	0.0652***	0.0013	0.9692***	11.9401**
	0.8751	*19.6175*	*0.1704*	*21.0889*	*0.0896*		0.0070	1.8109	0.0195	1.6661	0.0045	
IRELEND	-0.1196**	-0.0638	-0.2649	-0.0572	0.8884***	62.0393***	0.0231	-0.0063	0.1788**	0.0014	0.9345***	16.2850***
	0.0560	*1.6985*	*0.2102*	*1.8008*	*0.0747*		0.0599	1.6157	0.0452	1.5110	0.0045	
ISRAEL	-0.0801	0.0027	-0.2451	0.0123	0.9007***	36.7001***	0.0550	0.0175	0.1569***	-0.0229	0.9296***	18.8066***
	0.0684	*1.7669*	*0.0272*	*1.8655*	*0.0310*		0.2389	7.4124	0.0271	6.9117	0.0489	
ITA	-0.1415	0.0049	-0.2579	-0.0029	0.8860***	83.7996***	0.0424	-0.0019	0.2118***	-0.0157	0.9173***	61.8141***
	0.1136	*3.1177*	*0.0512*	*3.3020*	*0.0217*		0.2120	4.6418	0.0169	4.4363	0.0343	
JAP	-0.3083***	0.0160	-0.4659***	-0.0379	0.7792***	513.8612***	0.0930	0.0031	0.2304***	0.0033	0.8906***	19.6229***
	0.0427	*0.0143*	*0.0389*	*0.0901*	*0.0213*		0.1307	7.2003	0.0263	6.5439	0.0358	
KOR	-0.0124	-0.0107	-0.2205	0.0053	0.9343***	56.9429***	-0.0003	-0.0068	0.1124***	0.0073	0.9655***	3.4079
	0.1431	*3.8995*	*0.1404*	*4.1561*	*0.0513*		0.0095	1.6706	0.0219	1.5353	0.0077	
NET	-0.1469***	-2.0637***	-0.2843***	-2.1882***	0.9113***	49.3126***	0.0249	-0.0026	0.2001***	-0.0036	0.9254***	18.8091***
	0.0379	*0.3189*	*0.0725*	*0.3431*	*0.0261*		0.4743	15.2789	0.0685	14.4404	0.0514	
POR	-0.0221	0.0000	-0.3991	-0.0046	0.8834***	39.0645***	0.1338***	-0.0056	0.2797***	-0.0083	0.8624***	43.1344***
	0.5774	*16.3642*	*0.7673*	*17.1977*	*0.1073*		0.0181	0.2522	0.0279	0.2368	0.0129	
SWE	-0.1416*	-0.0522	-0.3012***	0.0259	0.8598***	82.6333***	0.0168*	-0.0104	0.1807***	0.0000	0.9393***	38.6024***
	0.0759	*1.6292*	*0.0373*	*1.7407*	*0.0229*		0.0101	0.3743	0.0475	0.3465	0.0108	
SWISS	-0.1723	0.0111	-0.3509	0.0000	0.8369***	42.3022***	0.0554***	-0.0079	0.2396***	0.0010	0.8993***	14.7372***
	0.2817	*6.4169*	*0.2596*	*6.6578*	*0.1493*		0.0099	0.5848	0.0343	0.5349	0.0161	
TAIWAN	-0.1413**	-0.2367	-0.1803***	-0.2600	0.9161***	44.6591***	0.0016	0.0000	0.1457	-0.0083	0.9560**	8.1000*
	0.0654	*2.3889*	*0.0390*	*2.4753*	*0.0387*		0.2739	24.6291	0.4782	23.0192	0.4226	
UK	-0.0781***	-0.0079	-0.3593***	-0.0073	0.8630***	88.1012***	0.0222	-0.0035	0.1898***	-0.0022	0.9265***	11.6415***
	0.0174	*3.4677*	*0.1063*	*3.6535*	*0.0849*		0.1943	4.5081	0.0615	4.2178	0.0490	
US	-0.0616	-0.0573	-0.2167	-0.0551	0.9160***	60.9996***	0.0259	0.0089	0.2726***	-0.0004	0.9046***	8.4662*
	0.0991	*5.8170*	*0.1984*	*5.6106*	*0.0063*		0.0361	0.9600	0.0529	0.8992	0.0146	

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL B: Emerging Countries							PANEL B: Emerging Countries					
BRA	-0.1326	-0.0333	-0.3753	0.0001	0.8615***	6.4166	0.0027	0.0005	0.2171***	0.0067	0.9290***	24.8361***
	0.7261	*26.8505*	*0.3805*	*28.0704*	*0.0696*		*0.0068*	*0.7439*	*0.0165*	*0.6879*	*0.0044*	
CHILE	-0.0854**	-0.0100	-0.5056***	-0.0144	0.8193***	32.2095***	0.0382*	-0.0001	0.3241***	-0.0009	0.8753***	21.6585***
	0.0346	*0.9712*	*0.0500*	*1.0117*	*0.0262*		*0.0218*	*0.1074*	*0.0285*	*0.0120*	*0.0201*	
CHN	-0.0729	-0.0308	-0.2165***	0.0063	0.9200***	82.45155***	0.0822**	0.0243	0.2050***	-0.0494	0.9247***	47.2520***
	0.3003	*9.0030*	*0.0466*	*9.5091*	*0.0234*		*0.0334*	*0.1394*	*0.0446*	*0.1342*	*0.0170*	
COL	0.0045	0.0005	0.0027	-0.0002	1.0019***	25.0928***	0.3962***	-0.0604	0.6508***	0.0143	0.7069***	26.5671***
	0.0176	*1.3409*	*0.0222*	*1.4174*	*0.0208*		*0.0351*	*3.4198*	*0.0241*	*3.0554*	*0.0141*	
HUN	-0.0520	-0.0165	-0.3726***	0.0315	0.8733***	69.6241***	0.0183	0.0275	0.2177***	-0.0052	0.9279***	49.6630***
	0.0723	*0.9798*	*0.0302*	*1.0456*	*0.0155*		*0.0173*	*1.8274*	*0.0090*	*1.7055*	*0.0039*	
INDIA	-0.0967	-0.0144	-0.5842***	0.0998	0.8080***	2.6574	0.0811	-0.0110	0.2074***	-0.0087	0.9089***	60.9176***
	0.1566	*3.0634*	*0.1666*	*3.1554*	*0.0507*		*0.0151*	*0.8090*	*0.0039*	*0.7626*	*0.0079*	
INDO	-0.2923	-0.0072	-0.4307	-0.0037	0.8160	10.5668**	0.0097	0.0087	0.1878***	0.0041	0.9430***	80.7194***
	1.5285	*65.2231*	*1.4620*	*68.5003*	*0.7813*		*0.2870*	*15.7363*	*0.0256*	*14.5150*	*0.0262*	
MALAY	-0.1156***	-0.0056	-0.5477***	0.0481	0.8023***	0.1839	0.0039	0.0041	0.2839***	0.0064	0.9162***	26.9893***
	0.0402	*0.6956*	*0.0825*	*0.8184*	*0.0324*		*0.0473*	*0.9491*	*0.1068*	*0.8712*	*0.0621*	
MEX	-0.0273	-0.0046	-0.1280***	0.0100	0.9541***	11.7158**	0.0046	0.0303	0.2654***	-0.0094	0.9169***	9.5754**
	0.1532	*3.4690*	*0.0446*	*3.6421*	*0.0131*		*0.0076*	*0.7914*	*0.0136*	*0.7697*	*0.0078*	
PAKI	-0.2483	-0.3754	-0.3291	-0.4017	0.8519***	2.5596	0.1191	-0.0106	0.3808	0.0110	0.8567***	45.4647***
	10.6942	*215.8089*	*0.6529*	*228.4400*	*0.4989*		*0.2978*	*0.6609*	*0.6719*	*0.6791*	*0.2274*	
PERU	-0.2363	-0.0175	-0.9304***	-0.0467	0.7014***	16.1259***	0.1143	-0.0156	0.3365***	-0.0122	0.8710***	24.8973***
	0.7073	15.4011	0.0578	16.3142	0.0462		*0.9165*	*67.6142*	*0.0854*	*64.4863*	*0.0932*	
THA	-0.1550***	-2.5121***	-0.3298**	-2.5589***	0.8876***	45.1411***	-0.0095	0.0089	0.2048***	0.0004	0.9454***	46.2637***
	0.0310	*0.9142*	*0.1579*	*0.9317*	*0.0463*		*0.0061*	*1.2862*	*0.0112*	*1.1825*	*0.0018*	

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level. c_2 is constant. a_{22} is the autoregressive mean coefficient. b_{22} is the autoregressive quantile coefficient. a_{21} and b_{21} are the autoregressive cross-coefficients. a_{21} and b_{21} are the autoregressive cross-coefficients. js is the statistic associated with the joint significance of the cross-coefficients.

Table 5

The U.S. sentiment and volatility estimated by the MVMQ (1,1) model at 1st and 99th quantiles for individual country

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the MVMQ (1,1) model and represent the estimation of the relationship between the U.S. sentiment and volatility at the left- and right-tail of the volatility distribution respectively. This table only reports coefficients associated with equation (2) because this study concentrates on measuring the responses of international equity markets to the U.S. sentiment shock. The dependent variable is quantile of volatility for 31 international equity markets. The independent variables are the lag of US sentiment, the lag of quantile of the U.S. sentiment, the lag of volatility, and the lag of quantile volatility respectively.

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL A: Developed Countries							PANEL A: Developed Countries					
AUS	0.0071	0.0382*	1.1046***	0.0344*	-0.3135***	78.7943***	0.0655***	-0.0198	1.1651***	0.0156	-0.0589*	38.2900***
	0.0092	*0.0200*	*0.0396*	*0.0200*	*0.0478*		*0.0233*	*0.0749*	*0.0252*	*0.0714*	*0.0356*	
CAN	0.0300	0.0001	1.1087***	0.0315	-0.3757***	61.6055***	0.0729**	0.2185***	1.3506***	-0.1762***	-0.2122**	21.7974***
	0.0211	*0.0545*	*0.0531*	*0.0618*	*0.0861*		*0.0331*	*0.0665*	*0.0783*	*0.0465*	*0.0844*	
DEN	-0.0170*	0.1448	1.0766***	0.1344	-0.2857***	77.5534***	0.1320***	-0.0312	1.2445***	0.0119	-0.1538***	26.2060***
	0.0227	*0.0832*	*0.0588*	*0.0888*	*0.0742*		*0.0321*	*0.0310*	*0.0274*	*0.0329*	*0.0225*	
FIN	0.0686*	-0.4883***	1.0653***	-0.4516** *	-0.3581***	81.1343***	0.1507***	0.0084	1.1726***	0.0561	-0.0956**	3.5399
	0.0365	*0.0635*	*0.0500*	*0.0520*	*0.0656*		*0.0413*	*0.1837*	*0.0357*	*0.1966*	*0.0486*	
FRA	-0.0447*	0.0184	1.2288***	-0.0043	-0.4264***	56.1139***	0.1396**	0.1244	1.3282***	-0.1358	-0.2185***	30.5161***
	0.0271	*0.2519*	*0.0299*	*0,2649*	*0.0430*		*0.0677*	*0.2002*	*0.0634*	*0.1744*	*0.0844*	
GER	-0.0046	-0.0026	1.0792***	-0.0376	-0.2984***	108.9815***	0.0927***	-0.0033	1.3709***	-0.0308	-0.2118***	30.1409***
	0.0198	*0.6032*	*0.0485*	*0.6188*	*0.0639*		*0.0270*	*0.5259*	*0.0694*	*0.4897*	*0.0564*	
ICELEND	0.1741	0.0040	0.3581	-0.0702	-0.3124	45.6924***	0.1614***	0.0135	1.0022***	-0.0058	0.0094***	8.3546*
	0.8669	*0.2618*	*2.3480*	*0.1141*	*1.6754*		*0.0280*	*1.5533*	*0.0739*	*1.4373*	*0.0725*	
IRELEND	0.0161	0.0004	0.9004***	0.0137	-0.0935	118.7689***	0.0778	-0.0003	0.9709**	0.0177	0.1268	29.4671***
	0.0155	*0.1260*	*0.0818*	*0.1336*	*0.0947*		*0.1526*	*17.6641*	*0.4568*	*16.3608*	*0.3873*	
ISRAEL	0.0000	-0.0355	1.0850***	-0.0756	-0.3387***	97.0360***	0.1156	0.0067	1.1100***	0.0224	-0.0427	42.2802***
	0.0222	*0.1242*	*0.0970*	*0.1343*	*0.1019*		*0.2174*	*8.9953*	*0.3601*	*8.2865*	*0.3947*	
ITA	-0.0291	0.0078	1.1611***	-0.0004	-0.3604***	96.7579***	0.1101**	0.0249	1.2534***	-0.0092	-0.1362	43.0901***
	0.0160	*0.0563*	*0.0955*	*0.073*	*0.1157*		*0.0534*	*1.2137*	*0.1461*	*1.1286*	*0.1494*	
JAP	0.0530**	0.0050	0.9709***	-0.0113	-0.2311***	34.2816***	0.1693	-0.1861**	1.3341***	0.1890**	-0.2573	36.3465***
	0.0212	*0.3472*	*0.0577*	*0.3627*	*0.0657*		*0.1078*	*0.0794*	*0.4867*	*0.0768*	*0.4763*	
KOR	0.0062	-0.0013	0.7982***	0.0189	0.0470	57.5182***	0.0668***	0.4377***	0.9257***	-0.3890***	0.1764***	78.1165***
	0.0847	*2.3965*	*0.0614*	*2.5081*	*0.0677*		*0.0168*	*0.0508*	*0.0569*	*0.0484*	*0.0529*	
NET	-0.0169	-0.1439	1.1490***	-0.1728	-0.3783***	47.5038***	0.0596	0.0157	1.2159***	0.0038	-0.0729	13.5366***
	0.0141	*0.2331*	*0.0577*	*0.2356*	*0.0677*		*0.0690*	*1.8767*	*0.1292*	*1.7847*	*0.1304*	
POR	0.0155	0.0008	1.0639***	-0.0118	-0.3268***	54.7235***	0.0321	-0.0111	1.3554***	-0.0089	-0.1492	38.5977***
	0.0174	*0.0465*	*0.0686*	*0.0535*	*0.0940*		*0.0355*	*0.6484*	*0.1781*	*0.6050*	*0.1424*	
SWE	-0.0363	-0.0023	1.1544***	0.0071	-0.3534***	7.8433*	0.1293***	-0.0024	1.4207***	0.0531	-0.2959***	30.2447***
	0.0376	*0.2887*	*0.0987*	*0.2739*	*0.0991*		*0.0477*	*0.6730*	*0.1015*	*0.7325*	*0.0612*	
SWISS	-0.0004	0.0093	1.1571***	0.0038	-0.4043***	78.6486***	0.0837	0.0475	1.4940***	-0.0130	-0.3454**	19.1424***
	0.0142	*0.1477*	*0.0645*	*0.1579*	*0.0726*		*0.0678*	*1.1511*	*0.1437*	*1.0723*	*0.1496*	
TAIWAN	0.0142	0.0093	0.8665***	-0.0110	-0.0856	23.9219***	0.1572	0.0721	1.1020***	-0.0627	-0.0162	11.6177**
	0.0254	*0.2216*	*0.2317*	*0.2296*	*0.2731*		*0.6613*	*76.9811*	*0.4956*	*70.8932*	*0.4507*	
UK	0.0014	0.0251	1.1299***	0.0327	-0.3383***	29.7348***	0.0891***	0.0012	1.1488***	-0.0183	-0.0432***	17.3761***
	0.0112	*0.0165*	*0.0541*	*0.0274*	*0.0709*		*0.0285*	*0.5182*	*0.1475*	*0.4832*	*0.1406*	
US	-0.0206	-0.2074***	1.0215***	-0.1985***	-0.2028	168.3726***	0.0764***	0.0125	1.1679***	0.0201	-0.0561***	25.2489***
	0.0165	*0.0195*	*0.1412*	*0.0249*	*0.1617*		*0.0223*	*0.4715*	*0.0747*	*0.4351*	*0.0704*	

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL B: Emerging Countries							PANEL B: Emerging Countries					
BRA	0.0791	-0.0113	0.9671***	0.0008	-0.2091	26.2786***	0.0872***	0.0146	1.3248***	0.0022	-0.1598***	12.9124**
	0.0724	*1.7865*	*0.1096*	*1.8498*	*0.1421*		*0.0328*	*1.6466*	*0.0278*	*1.5027*	*0.0077*	
CHILE	0.0462***	0.0069	1.0951***	0.0004	-0.4464***	38.3038***	0.0672	0.0072	1.4559***	-0.0286	-0.2808**	42.0160***
	0.0088	*0.0142*	*0.0331*	*0.0151*	*0.0395*		0.0481	*0.0340*	*0.1451*	*0.0294*	*0.1201*	
CHN	0.0901*	0.1646***	0.8454***	0.1805***	-0.1453**	61.6529***	0.1662***	0.0264	1.2856***	0.0333	-0.1614***	95.9432***
	0.0503	*0.0358*	*0.0642*	*0.4050*	*0.0638*		*0.0415*	*1.4743*	*0.0276*	*1.3642*	*0.0200*	
COL	0.1030***	0.0189	0.9419***	0.0436	-0.3290***	5.2050	0.1367	-0.0018	1.3960***	-0.0294	-0.2095***	23.2369***
	0.0322	*0.0535*	*0.1576*	*0.0700*	*0.2103*		*0.4599*	*161.0013*	*0.6501*	*148.0351*	*0.4608*	
HUN	0.0946**	-0.0651	1.0115***	-0.1006	-0.3364	42.6498***	0.1575**	-0.2452***	1.5037***	0.2009***	-0.3445***	58.4367***
	0.0435	*0.1536*	*0.2005*	*0.1646*	*0.2785*		*0.0715*	*0.0608*	*0.0413*	*0.0452*	*0.0395*	
INDIA	0.0606	0.0124	1.0530***	0.0020	-0.3607***	5.1797	0.1664*	-0.0447	1.2027***	0.0923	-0.1109**	28.5535***
	0.0582	*0.8007*	*0.0779*	*0.8342*	*0.1088*		*0.0911*	*0.0576*	*0.0705*	*0.0614*	*0.0507*	
INDO	0.0623**	0.2298***	1.0375***	0.2052**	-0.3786***	62.2609***	0.1874***	0.0899*	1.4175***	-0.0704	-0.2668***	73.1153***
	0.0282	*0.0701*	*0.0437*	*0.0808*	*0.0649*		*0.0335*	*0.0515*	*0.0287*	*0.0667*	*0.0261*	
MALAY	0.0652	0.0084	1.0104***	-0.0083	-0.4455***	1.8367	0.0397	-0.0007	1.3610***	0.0622	-0.1554	32.4759***
	0.0449	*0.2852*	*0.0915*	*0.2954*	*0.1584*		*0.0377*	*0.0849*	*0.2591*	*0.0875*	*0.2643*	
MEX	0.0320**	0.0002	0.9749***	0.0149	-0.2044**	8.4392*	0.0478**	0.4902***	1.4201***	-0.4301***	-0.2036**	161.1081***
	0.0126	*0.0411*	*0.0685*	*0.0633*	*0.0824*		*0.0204*	*0.0545*	*0.1202*	*0.0385*	*0.0937*	
PAKI	-0.0341**	0.0276	1.1066***	-0.0205	-0.4124***	14.1056***	0.1778***	-0.0239	1.2530***	0.0010	-0.1252***	23.8263***
	0.0133	*0.0748*	*0.0809*	*0.0805*	*0.1212*		*0.0470*	*2.8467*	*0.0453*	*2.6245*	*0.0476*	
PERU	0.0790***	0.1189***	1.0774***	0.1516***	-0.4362***	55.2058***	0.1146***	0.1491	1.3977	-0.1444	-0.2004	14.1249***
	0.0252	*0.0204*	*0.0909*	*0.0441*	*0.1261*		*0.0706*	*0.3471*	*1.5566*	*0.3927*	*1.2827*	
THA	0.0483***	0.0856	1.1354***	0.0873	-0.4312***	45.5009***	0.0727	0.0106	1.3121***	-0.0001	-0.1329	65.1921***
	0.0232	*0.3303*	*0.1416*	*0.3471*	*0.1568*		*0.9841*	*103.0884*	*0.3755*	*94.9168*	*0.2387*	

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level. c_2 is constant. a_{22} is the autoregressive mean coefficient. b_{22} is the autoregressive quantile coefficient. a_{21} and b_{21} are the autoregressive cross-coefficients. a_{21} and b_{21} are the autoregressive cross-coefficients. js is the statistic associated with the joint significance of the cross-coefficients.

Table 6

The U.S. sentiment and trading volume using the MVMQ (1,1) model at 1st and 99th quantiles for individual country

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the MVMQ (1,1) model and represent the estimation of the relationship between the U.S. sentiment and trading volume at the left- and right-tail of the trading volume distribution respectively. This table only reports coefficients associated with equation (2) because this study concentrates on measuring the responses of international equity markets to the U.S. sentiment shock. The dependent variable is quantile of trading volume for 13 international equity markets. The independent variables are the lag of US sentiment, the lag of quantile of the U.S. sentiment, the lag of trading volume, and the lag of quantile trading volume respectively.

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL A: Developed Countries							PANEL A: Developed Countries					
CAN	-0.6938***	-0.0716	-0.3519***	-0.0514	-0.1491***	41.3953***	CAN	0.4848	-0.0570	0.9113***	-0.1795	0.3473	44.5120***
	0.1101	*0.0653*	*0.0441*	*0.0907*	*0.1487*			*0.5553*	*15.7111*	*0.1007*	*14.5487*	*0.5799*	
JAP	-0.1028***	-0.0135	-0.2853***	-0.0143	0.6339***	5.2560	JAP	0.4565	0.1157	0.8815***	-0.4156	0.2559***	290.2878***
	0.0187	*0.0779*	*0.0324*	*0.0802*	*0.0446*			*0.0752*	*3.1369*	*0.0467*	*2.8839*	*0.0936*	
KOR	-0.1605***	-0.0010	-0.4403***	0.0010	0.3954***	16.1207***	KOR	0.0407***	-0.1962	0.4506***	0.2082	0.7726***	25.0622***
	0.0307	*0.0140*	*0.0757*	*0.0157*	*0.1053*			*0.0162*	*1.0582*	*0.0225*	*0.9621*	*0.0070*	
SWE	-0.2676***	-0.2795***	-0.2322***	-0.2956***	0.5040***	37.8022***	SWE	0.8404***	-0.0131	2.0790***	-0.0472	0.0495	14.2102***
	0.0519	*0.0831*	*0.0468*	*0.0873*	*0.0984*			*0.1510*	*0.3169*	*0.0701*	*0.2379*	*0.0693*	
TAIWAN	-0.0946***	-0.0317	-0.2402***	-0.0226	0.6708***	12.4383**	TAIWAN	0.2501***	0.0112	0.8548***	-0.0251	0.3018***	70.3587***
	0.0129	*0.0083*	*0.0252*	*0.0672*	*0.0378*			*0.0588*	*0.3545*	*0.0658*	*0.2918*	*0.0927*	
UK	-0.3705***	0.0139	-0.4613***	-0.0177	0.1798**	15.1527***	UK	0.2851	0.0584	0.3826**	-0.0091	0.4929	17.5202***
	0.0463	*0.0926*	*0.0350*	*0.1084*	*0.0728*			*0.4717*	*15.8748*	*0.1785*	*14.9066*	*0.6954*	
PANEL B: Emerging Countries							PANEL B: Emerging Countries					
CHN	-0.3008***	0.0216***	-0.3808***	0.0225***	0.3132***	212.2594***	CHN	0.8153***	1.0976**	1.1106***	-1.5769***	0.1174**	68.3652***
	0.0338	*0.0016*	*0.0413*	*0.0016*	*0.0703*			*0.2075*	*0.4421*	*0.0712*	*0.2433*	*0.0587*	
INDIA	-0.1466***	-0.0074	-0.3494***	-0.0022	0.5039***	92.7262***	INDIA	0.4212***	-0.0476	0.8387***	-0.2236	0.3620***	137.1269***
	0.0194	*0.0281*	*0.0462*	*0.0294*	*0.0637*			*0.0526*	*0.1898*	*0.0644*	*0.1780*	*0.0548*	
INDO	-0.8022	-0.0293***	0.0009***	-0.0380***	0.1778	478.9578***	INDO	0.9968	-1.0690	0.6139	1.2212	0.0002	9341.6203***
	0.9793	*0.0091*	*0.0000*	*0.0138*	*1.0062*			*2.0023*	*224.8100*	*0.5513*	*206.8630*	*0.2528*	
MALAY	-0.1327***	-0.0021	-0.0673***	-0.0010	0.7850***	108.7509***	MALAY	0.4570***	-0.2391	0.8255**	-0.0567	0.5036	282.8186***
	0.0467	*0.0505*	*0.0221*	*0.0530*	*0.0739*			*0.1021*	*122.5133*	*0.3937*	*115.0354*	*0.8005*	
MEX	0.0005	0.0006	-0.0002	0.0006	1.0003***	125.1998***	MEX	0.5782***	-0.0229	0.8280***	-0.2878	0.4726	100.5272***
	0.0011	*0.0199*	*0.0003*	*0.0204*	*0.0009*			*0.1202*	*79.2334*	*0.0128*	*72.8899*	*0.4276*	
PAKI	-0.5061***	0.0084	-0.2843***	0.0035	0.2138	0.3276	PAKI	0.3770***	- 0.1379	0.8861***	0.0139	0.3983***	53.1127***
	0.1289	*0.0596*	*0.0959*	*0.0617*	*0.2091*			*0.0972*	*3.2503*	*0.0422*	*3.1934*	*0.0189*	
THA	-0.1522***	0.0215***	-0.1564***	0.0255***	0.6891***	132.6728***	THA	0.4467***	0.0312	1.1724***	-0.3959	0.3633***	406.3363***
	0.0169	*0.0080*	*0.0220*	*0.0086*	*0.0381*			*0.0325*	*0.6062*	*0.0350*	*0.5656*	*0.0250*	

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level. c_2 is constant. a_{22} is the autoregressive mean coefficient. b_{22} is the autoregressive quantile coefficient. a_{21} and b_{21} are the autoregressive cross-coefficients. a_{21} and b_{21} are the autoregressive cross-coefficients. js is the statistic associated with the joint significance of the cross-coefficients.

Table 7

The U.S. sentiment and average return using the MVMQ (1,1) model at 1st and 99th quantiles by criteria

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the MVMQ (1,1) model and represent the estimation of the relationship between US sentiment and return at the left- and right-tail of the return distribution respectively. Average return is computed by using average value among countries classified in each criterion. This table only reports coefficients associated with equation (2) because this study concentrates on measuring the responses of international equity markets to the U.S. sentiment shock. The dependent variable is quantile of average return for 31 international equity markets. The independent variables are the lag of the U.S. sentiment, the lag of quantile of the U.S. sentiment, the lag of average return, and the lag of quantile of average return respectively.

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL A: Economic Criteria							PANEL A: Economic Criteria					
Developed	-0.0611***	-0.0158	-0.2938***	0.0001	0.8826***	83.0247***	0.0057	-0.0228	0.1704***	0.0187	0.9381***	16.7646***
	0.0150	*0.8568*	*0.0593*	*0.9044*	*0.0293*		*0.3609*	*10.2548*	*0.0592*	*9.6435*	*0.1408*	
Emerging	-0.0851	0.0054	-0.5157***	-0.0085	0.8222***	14.7503***	0.0078	0.0076	0.1995***	0.0012	0.9268***	11.9196***
	0.0779	*1.2171*	*0.0959*	*1.2757*	*0.0419*		*0.0096*	*0.2001*	*0.0102*	*0.1897*	*0.0081*	
PANEL B: Geographical Criteria							PANEL B: Geographical Criteria					
AP	-0.0699	0.0172	-0.5317	0.0073	0.8271**	50.1757***	0.0165	0.0076	0.1770***	-0.0057	0.9308***	35.6494***
	0.5352	*20.7972*	*0.6686*	*21.8007*	*0.3743*		*0.0123*	*0.6421*	*0.0090*	*0.5921*	*0.0037*	
LA	-0.1333	-0.0178	-0.5478***	-0.0002	0.7934***	16.8435***	0.0067	-0.0014	0.2779***	0.0045	0.9065***	43.6139***
	1.1387	*24.1342*	*0.1848*	*25.3870*	*0.0899*		*0.0090*	*1.0666*	*0.0397*	*0.9733*	*0.0121*	
NA	-0.0544**	-0.0722	-0.2251***	-0.0699	0.9162***	37.6065***	0.0028	0.0040	0.2483*	-0.0044	0.9163***	11.0863***
	0.0219	*0.4327*	*0.0595*	*0.4512*	*0.0178*		*0.0426*	*1.0740*	*0.1284*	*0.9783*	*0.0581*	
EU	-0.1122***	-0.0157	-0.3100***	0.0038	0.8574***	96.6669***	0.0155	-0.0069	0.2239*	0.0000	0.9183***	18.5861***
	0.0326	*2.9690*	*0.0372*	*3.1207*	*0.0536*		*0.2024*	*5.0640*	*0.1177*	*4.6556*	*0.0608*	

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level. c_2 is constant. a_{22} is the autoregressive mean coefficient. b_{22} is the autoregressive quantile coefficient. a_{21} and b_{21} are the autoregressive cross-coefficients. a_{21} and b_{21} are the autoregressive cross-coefficients. js is the statistic associated with the joint significance of the cross-coefficients.

Table 8

The U.S. sentiment and average volatility using the MVMQ (1,1) model at 1st and 99th quantiles by criteria

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the MVMQ (1,1) model and represent the estimation of the relationship between the U.S. sentiment and volatility at the left- and right-tail of the volatility distribution respectively. Average volatility is computed by using average value among countries classified in each criterion. This table only reports coefficients associated with equation (2) because this study concentrates on measuring the responses of international equity markets to the U.S. sentiment shock. The dependent variable is quantile of average volatility for 31 international equity markets. The independent variables are the lag of the U.S. sentiment, the lag of quantile of the U.S. sentiment, the lag of aveage volatility, and the lag of quantile average volatility respectively.

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL A: Economic Criteria							PANEL A: Economic Criteria					
Developed	0.5431***	0.0013	1.0732***	-0.0004	-0.6767***	88.0597***	-0.2203***	0.0063***	1.4230***	-0.0060***	-0.1757***	35.7689***
	0.0457	*0.0011*	*0.0593*	*0.0010*	*0.0797*		*0.0132*	*0.0024*	*0.0244*	*0.0022*	*0.0105*	
Emerging	0.1613***	-0.0009	1.1859***	-0.0015*	-0.4442***	25.4712***	-0.1358***	0.0173***	1.5187***	-0.0123***	-0.2965***	100.2662***
	0.0058	*0.0008*	*0.0158*	*0.0009*	*0.0227*		*0.0093*	*0.0035*	*0.0352*	*0.0033*	*0.0273*	
PANEL B: Geographical Criteria							PANEL B: Geographical Criteria					
AP	0.1448***	-0.0028	1.1192***	-0.0044	-0.3387***	47.8471***	-0.0961***	0.0294***	1.3847***	-0.0261***	-0.2278***	99.8171***
	0.0048	*0.0026*	*0.0206*	*0.0028*	*0.0265*		*0.0054*	*0.0031*	*0.0427*	*0.0030*	*0.0385*	
LA	0.2425***	-0.0231	0.9906***	-0.0208	-0.2923***	75.7884***	-0.2285***	0.0658***	1.4587***	-0.0573***	-0.1674***	43.6139***
	0.0167	*0.0141*	*0.0246*	*0.0146*	*0.0367*		*0.0228*	*0.0184*	*0.0381*	*0.0167*	*0.0136*	
NA	0.2259***	-0.0675***	1.0788***	-0.0635***	-0.3571***	260.8720***	-0.1557***	0.0019	1.3749***	0.0083	-0.1636**	18.5223***
	0.0255	*0.0050*	*0.0251*	*0.0042*	*0.0474*		*0.0273*	*0.2197*	*0.0914*	*0.2039*	*0.0751*	
EU	0.3983***	0.0117***	1.0325***	0.0106***	-0.4217***	741.1906***	-0.2712***	0.0129***	1.3904***	-0.0098**	-0.1228***	36.5451***
	0.0404	*0.0039*	*0.0163*	*0.0038*	*0.0268*		0.0312	0.0048	0.1056	0.0045	0.0783	

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level. c_2 is constant. a_{22} is the autoregressive mean coefficient. b_{22} is the autoregressive quantile coefficient. a_{21} and b_{21} are the autoregressive cross-coefficients. a_{21} and b_{21} are the autoregressive cross-coefficients. js is the statistic associated with the joint significance of the cross-coefficients.

Table 9

The U.S. sentiment and trading volume using the MVMQ (1,1) model at 1st and 99th quantiles for by criteria

This table reports estimated coefficients in the first row and standard errors in italic in the second row. Estimated coefficients correspond to the MVMQ (1,1) model and represent the estimation of the relationship between the U.S. sentiment and trading volume at the left- and right-tail of the trading volume distribution respectively. Average trading volume is computed by using average value among countries classified in each criterion. This table only reports coefficients associated with equation (2) because this study concentrates on measuring the responses of international equity markets to US sentiment shock. The dependent variable is quantile of average trading volume for 13 international equity markets. The independent variables are the lag of the U.S. sentiment, the lag of quantile of the U.S. sentiment, the lag of average trading volume, and the lag of quantile average trading volume respectively.

	θ = 0.01						θ = 0.99					
	c2	a21	a22	b21	b22	js	c2	a21	a22	b21	b22	js
PANEL A: Economic Criteria							PANEL A: Economic Criteria					
Developed	-0.1176***	-0.0087	-0.4603***	0.0143	0.4276***	20.2523***	0.3572***	-0.0103	0.7932***	-0.0962	0.1892	44.0725***
	0.0258	*0.4221*	*0.0722*	*0.4429*	*0.0910*		*0.0721*	*0.3145*	*0.1752*	*0.2891*	*0.1396*	
Emerging	-0.0892***	0.0213*	-0.2205***	0.0223*	0.6935***	33.6041***	0.3774	0.2285	0.7846	-0.5057	0.3474	3.1677
	0.0288	*0.0112*	*0.0793*	*0.0118*	*0.1054*		*4.4791*	*560.2036*	*0.8538*	*515.230*	*0.4687*	
PANEL B: Geographical Criteria							PANEL B: Geographical Criteria					
AP	-0.0870***	-0.0011	-0.2604***	0.0015	0.6526***	47.8471***	0.4595***	0.1685	1.1024***	-0.4082	0.0196	11.6505**
	0.0201	*0.0183*	*0.0691*	*0.0185*	*0.0870*		*0.1100*	*0.3138*	*0.2782*	*0.3108*	*0.2182*	
LA	-0.8480***	-0.0701	-0.1157***	0.0399	0.0152	86.3145***	0.5442***	-0.2119	0.8265***	-0.1024	0.4870***	186.9125***
	0.2781	*0.2789*	*0.0419*	*0.2876*	*0.3060*		*0.0805*	*1.3860*	*0.0067*	*1.2614*	*0.0378*	
NA	-0.6938***	-0.0716	-0.3519***	-0.0514	-0.1491	41.3953***	0.4848	-0.0570	0.9113***	-0.1795	0.3473	44.5120***
	0.1101	*0.0653*	*0.0441*	*0.0907*	*0.1487*		*0.5553*	*15.7111*	*0.1007*	*14.5487*	*0.5799*	
EU	-0.3617***	0.0422*	-0.4495***	0.0213	0.1654	17.2396***	0.4079	-0.3368	1.5235***	0.2781	0.1669	30.5560***
	0.0544	*0.0217*	*0.0504*	*0.0270*	*0.1036*		*0.5193*	*83.3690*	*0.3371*	*76.4903*	*0.8777*	

Note: * indicates statistical significance at 10% level. ** indicates statistical significance at 5% level. *** indicates statistical significance at 1% level. c_2 is constant. a_{22} is the autoregressive mean coefficient. b_{22} is the autoregressive quantile coefficient. a_{21} and b_{21} are the autoregressive cross-coefficients. a_{21} and b_{21} are the autoregressive cross-coefficients. js is the statistic associated with the joint significance of the cross-coefficients.