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STOCK MARKET SENSITIVITY TO MACROECONOMIC FACTORS: EVIDENCE FROM CHINA AND INDIA

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ABSTRACT

The purpose of this study is to analyse the impact of Chinese macroeconomic factors on Shanghai Stock Exchange (SSE) Composite returns and Indian macroeconomic factors on Nifty returns based on monthly data from January 1998 to December 2018. This study adopts quantile regression approach. The QR allows examining the conditional dependence of specific quantile of SSE and Nifty returns with respect to the conditioning factors. The authors present results for two sample periods that are pre-recession and recession period from 1998 to 2008 and the post-recession period from 2009 to 2018. This paper also documents quite interesting and useful results for the entire period. From the results, It is concluded that Chinese consumer price index significantly affects the SSE returns only for lower quantiles. However, Indian consumer price index has a significant and positive impact on the Nifty returns for the upper quantiles. Further, Chinese interest rates and Indian interest rates have no impact on the SSE and Nifty returns respectively across the different quantiles. Moreover, the Chinese exchange rate influence the SSE returns at the extreme dataset. However, the Indian exchange rate is insignificant. It is important to note that the dependence structure of China shows a negligible change during the post-recession period. Conversely, the dependence structure has changed significantly for India post-recession. The implication of this paper would guide stock market participants.

Contribution/ Originality: This research is the first application of Quantile Regression approach to address this issue. This study gives some concrete suggestions to investors. First, investors should carefully invest in the Chinese stock market using the Chinese Consumer Price Index and Exchange Rate. Second, avoid investing in the Indian stock market using Indian Interest Rate and Exchange Rate.

1. INTRODUCTION

China and India share some common factors such as vast geographical area, supportive government policies, large labour forces and the emergence of a middle class that are indispensable in holding long-term economic growth and, in addition to that, have the potential to turn behemoth economies (Lao and Singh, 2011). It is anticipated that the combined spending of China and India could be more significant than that of the Group of Six by 2050 (Samitas *et al.*, 2007). Managers of large funds and other international institutional investors are

accrediting the growing influence of these markets and adding more weight in their investment portfolios (Lao and Singh, 2011). A major reason behind the selection of China and India is that these two emerging economies have different economic environment. Thus, it becomes necessary for the investment participants to understand the unique features of China and India before making better financial decision on where to put their money. The macroeconomic factors are the major determinants of the growth of an economy (Pal and Mittal, 2011). From an investment perspective, investors consider contributing macroeconomic environment as it helps companies to increase their profitability.

Therefore, the present study analyses the impact of Chinese Consumer Price Index (CPI), Interest Rate (IR) and Exchange Rate (ER) on Shanghai Stock Exchange (SSE) Composite Index returns and Indian CPI, IR and ER on the Nifty 50 Index returns using quantile regression (QR) approach (Koenker and Bassett, 1978).

More precisely, this paper addresses the following unanswered questions. Does dependence exist between macroeconomic factors and stock markets concerning China and India? Is there any symmetric or asymmetric dependence of Chinese and Indian stock markets on each of the specific macroeconomic components? Has the dependence structure changed the post-global financial crisis?

The following would be the key contributions of this paper to the existing kinds of literature; First, the analysis on the impact of the macroeconomic factors on Chinese and Indian stock markets using QR method is presented for the first time, to the best of the authors knowledge. Second, the authors have scrutinized whether the Chinese and Indian Stock markets are symmetric or asymmetric during the pre and post-recession period.

The rest of this paper is divided into the following sections. Section two shows a review of relevant literature. The data and variables are shown in Section three. The fourth section of this study illustrates the QR methodology. Section five contains the empirical results and discussion. Finally, Section six concludes the paper and gives recommendations to further research.

2. REVIEW OF LITERATURE

An abundance of studies has analysed the impact of macroeconomic factors on Chinese and Indian stock markets worldwide at different point of time and under different circumstances. The study of Hosseini *et al.* (2011) finds both long and short-run linkages between macroeconomic variables (crude oil price, money supply, industrial production and inflation rate) and stock market indices of China and India. Lao and Singh (2011) identifies that the herding behaviour exists in both Shanghai A-Share index and SENSEX. In the Chinese market, herding behaviour is more significant when the market falls, and the trading volume is high. On the other hand, in India, it occurred during up-swings. Soenen and Johnson (2001) confirm the impact of inflation and real industrial production on the Chinese stock market. The event study method used by Singhania and Girish (2015), reveals that macroeconomic events (i.e. 2000 dot-com bubble, 2008 Global financial crisis and 2015 announcement of Yuan Renminbi consideration in the SDR basket) have negative effects on returns of SSE Composite Index. The research conducted by Chen (2007) notices that Chinese hotel stock returns are more sensitive to macro variables and Non-macro event i.e. financial crisis Past studies specifically concerning India. The study results of Pal and Mittal (2011) reveal that interest rates affect Nifty only and the exchange rate has a significant impact only on Sensex. Subsequently, the study of Patel (2012) reveals that interest rate, inflation, exchange rate are the significant factors affecting Nifty. However, Sudharshan *et al.* (2016) illustrates an inverse association between exchange rates and share prices of information technology companies. Pani *et al.* (2019) analyse the influence of National and International economic and political events and other major world indices on the stock market in India. Most of the studies have confirmed the impact of macroeconomic elements on Indian stock market(Das and Megaravalli, 2017; Ashwani and Sheera, 2018; Bhuvaneshwari and Ramya, 2018; Mitra, 2018; Sengupta *et al.*, 2019).

Considerable research has been conducted on the determinants of stock markets using QR method. The study of Mensi *et al.* (2014) has examined the influence of global economic variables on the stock market of Brazil, Russia,

India, China and South Africa (BRICS). The co-movement between the Chinese stock returns and the global stock market index returns is not observed. However, crude oil prices have a negligible impact on Chinese stock returns. In contrast, the crude oil prices affect Indian stock returns only in the upper quantiles. However, the impact is significantly negative for the lower quantiles. The findings of Jareño *et al.* (2016) reveal that interest rates and inflation affect the different sectors in the USA. The research work of Ni *et al.* (2015) reveals that the effect of investor sentiment is asymmetric and reversal in the Chinese A-share stock market. Gebka and Wohar (2013) analyse the causality between past trading volume and index returns in the Pacific Basin countries. The study observes a lack of causality between volume and raw returns and a strong causal relationship between volume and returns volatility.

On the other context, Cai *et al.* (2009) use the Double Smooth Transition Conditional Correlation with Conditional Auto Regressive Range model and find that average CPI and Volatility Index (VIX) have essential effects on stock correlations. The research of Dimitriou *et al.* (2013) has investigated the contagion impact of the global financial crisis in a multivariate Fractionally Integrated Asymmetric Power ARCH dynamic conditional correlation framework. The study does not affirm a contagion influence for most BRICS during the early stages of the crisis. Xu and Hamori (2012) apply Cross-Correlation Function approach and find the international transmission of stock prices between the BRIC and the United States significantly weakened after the 2008–09 financial crisis. The study of Minh *et al.* (2019) finds that the size risk has a significant and positive impact on small-sized Vietnamese real estate stocks returns while the negative impact on large-sized companies.

This paper seeks to explore how the macroeconomic factors of China and India affect their respective stock markets, i.e. SSE and Nifty returns respectively. This phenomenon has not been noted before. As far as the literature, there is no study that investigates this issue using the QR method. Therefore, the authors have attempted to plug the gap and extended the literature.

3. ECONOMETRIC METHODOLOGY

The correlation coefficient is widely applied to assess the dependence between the variables. However, it does not capture the differentiation during up and down markets or movements between large and small investment product. Further, it studies only symmetric linear dependence between the variables. Thus, a much effectual technique is needed in order to detect the complicated dependence structure between financial time series data. The conditional mean and conditional median can be estimated employing the Ordinary Least Square (OLS) regression. According to Mosteller and Tukey (1977), OLS provides an incomplete description of a conditional distribution. Further, OLS regression is not much helpful when the analysis attempts to extend beyond the median or towards the extremes of a dataset. Hence, a more advanced tool is required to catch the complex dependence structure.

QR methodology is introduced by Koenker and Bassett (1978)[1]. QR is employed in modelling dependence as it can cover a set of regression curves that differ across different quantiles (e.g. median) of the conditional distribution of the dependent variable. QR is non-OLS regression. The estimator may vary from 0 to 1 with each quantile. Thus, the study uses QR to model the relationship between macroeconomic factors and the conditional quantiles of stock markets returns in China and India rather than just the conditional mean of SSE and Nifty returns.

The QR approach provides the following relevant advantages:

- QR is flexible for modeling data with heterogeneous conditional distributions.
- Median regression is more robust to outliers than the OLS regression.
- QR captures different effects of the independent variables on the dependent variable depending across the spectrum of the dependent variable.

The QR model of Koenker and Bassett (1978) can be written as:

[1] For more information on the model specification of quantile regression, refer to Koenker and Bassett (1978).

$$y_i = x'_i\beta_\theta + u_{\theta i} \text{ with } Q_\theta(y_t|x_t) = x'_t\beta_\theta \quad (1)$$

Where x'_t indicates a vector of regressors, β_θ denotes the vector of parameters to be estimated and $u_{\theta i}$ represents a vector of residuals. $Q_\theta(y_t|x_t)$ shows the θ^{th} conditional quantile of y_i granted x'_i.

The approximation of β_θ is supported on the undermentioned optimization problem[2]:

$\beta_\theta = \text{argmin}_\beta$

$$\left\{ \sum_{t:yt>x'_t\beta} \theta|y_i - x'_i\beta| + \sum_{t:yt>x'_t\beta} (1-\theta)|y_i - x'_i\beta| \right\} \quad (2)$$

A linear programming representation via the simplex algorithm or the generalized method of moments framework can be applied to solve the optimization problem (Brooks, 2014). The median regression is received by placing $\theta = 0.5$. Different quantiles of the conditional distribution can be found through variations of θ. The results for the 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 quantiles express gumption for the relationship of selected explanatory variables across the SSE and Nifty returns distribution. In this paper, the proposed study goes to the bootstrap method exemplified in Buchinsky (1995) to hold approximations of the standard errors for the coefficients in quantile regression. Further, it is useful for a comparatively minor sample size.

The following equations are the basic models of this empirical study:

$$SSE\ Returns = \alpha + \beta_1 \text{CHCPI} + \beta_2 \text{CHIR} + \beta_3 \text{CHER} + \varepsilon \quad (3)$$

Where CHCPI, CHIR and CHER denote Consumer Price Index, Interest Rate and Exchange Rate of China respectively and ε is a random error.

$$Nifty\ Returns = \alpha + \beta_4 \text{INDCPI} + \beta_5 \text{INDIR} + \beta_6 \text{INDER} + \mu \quad (4)$$

Where, INDCPI, INDIR and INDER indicate Consumer Price Index, Interest Rate and Exchange Rate of India respectively, and μ is a random error.

4. DATA AND VARIABLES

This paper empirically examines the impact of macroeconomic factors on Chinese and Indian stock markets over the monthly[3] period from January 1998 to December 2018. The present study divides data into two sample periods that is pre-recession and recession period from 1998-2008 and the post-recession period from 2009 to 2018. The Chinese and Indian macroeconomic factors include (i) consumer price index; (ii) interest rates;[4] and (iii) exchange rate. The authors have taken log-returns of the SSE and Nifty index. The SSE and Nifty data are

[2] Refer to Buchinsky, M., 1995. Estimating the asymptotic covariance matrix for quantile regression models a Monte Carlo study. Journal of Econometrics, 68(2): 303-338.Available at: https://doi.org/10.1016/0304-4076(94)01652-G. for further details on QR.

[3] The authors have selected monthly frequency to daily or weekly because daily volatility is higher than weekly volatility; successively, weekly volatility is higher than monthly volatility.

[4] It is less than 24 Hours Call Money/Interbank Rate.

gathered from Statistics Yahoo Finance (2018). The authors have obtained the data of CPI, IR and ER for both the countries from (Statistics FRED, 2018) Database.

The study chooses these variables based on their relevance for the stock market returns in China and India. The extent of inflation or deflation is reflected in the change rate of the CPI. CPI increases with high rates of economic growth. The companies' credit and reinvestment risks are affected due to the expectation of changes in the inflation rate. Companies' costs can be affected due to movement in interest rates, and the main effect can be found in the profitability of companies. The appreciation or depreciation in the exchange rate affects the country's import and export. In these contexts, it is expected to have the influence of macroeconomic factors on the SSE and Nifty returns.

5. RESULTS AND DISCUSSION

The results of descriptive statistics and unit root tests are presented in Table 1. First, the null hypothesis of a unit root is tested using the conventional Augmented Dickey and Fuller (ADF) and Phillips and Perron (PP) statistics and the stationarity property under the null using the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test. SSE, Nifty returns, Chinese and Indian IRs have no unit root. However, Chinese and Indian CPI and ER have a unit root; therefore, the authors include these variables in the first differences and confirm the stationarity. Further, the results of descriptive statistics indicate that the mean value of all the variables is more than the median. Therefore, these variables appear to be skewed to the right. Kurtosis value for all the explanatory variables (except SSE and Nifty returns and Chinese IR) is less than the reference value of normal distribution that is equal to 3. It indicates that there are lighter tails than a normal distribution (less in the tails). The Jarque-Bera (JB) test for normality shows that all the variables under consideration do not follow normality.

This section mainly describes the QR results for the SSE and Nifty returns during 1998-2008 and 2009-2018. The results also cover the entire 1998-2018 period. The results for Chinese and Indian CPI, IR and ER for the 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 quantiles are provided in this section. The SSE returns are estimated with Equation 3 using the QR method, with a quantile ranging from 0.1 to 0.9 (Table 2, Table 4 and Table 6). Moreover, we estimate Nifty returns with Equation 4 using the QR method (Table 3, Table 5 and Table 7). The changes in the QR coefficients for both countries are also shown in the QR graph from Figure 1 to 6. The prefix 'X' in graphs indicates the explanatory variable.

5.1. Dependence Structure between Stock Market Returns and Macroeconomic Factors during 1998-2008

For China, the QR results are presented in Table 2 and Figure 1. It is interesting to note that the sign of coefficients is not uniform across the quantiles for CPI and IR.The dependence between the SSE returns and inflation as represented by the CPI is significant and negative only for 0.1 quantile, whereas significant but positive for 0.8 quantile. However, the quantile estimated coefficients for the intermediate quantiles are insignificant. Further, the SSE return is not influenced by IR for lower, intermediate and upper quantiles. Moreover, ER has no impact on the SSE returns across the different quantiles.

For India, the results given in Table 3, and Figure 2 unveils that CPI is significant only for the lower quantiles and the impact is not present for the intermediate and upper quantiles (except 0.8 quantile). However, the Nifty returns moves negatively with CPI. This result is similar to Hosseini *et al.* (2011) who show that the contemporaneous impact of inflation on the SSE is positive and significant, and the contemporaneous impact is negative but insignificant for India. In contrast, QR estimates for the Nifty returns show a statistically significant impact of IR on the Nifty in 0.2, 0.3 and 0.4 quantiles, but the impact is negligible for 0.1, 0.5 and 0.7 quantiles. However, 0.6 and 0.8 quantiles are insignificant. The quantile estimated coefficients for IR indicate a negative sign. Thus, there is an inverse relationship between IR and the Nifty returns.

Table-1. Descriptive statistics, unit root tests and stationarity of the explanatory and explained variables.

Variables	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis	JB	ADF	PP	KPSS
									Unit root		Stationary
SSE Returns	0.121	0.060	18.364	-22.059	4.088	-0.152	11.045	680.489***	-12.012***	-11.934***	0.039
Nifty Returns	0.541	0.150	18.146	-9.749	2.968	1.375	11.790	890.673***	-12.640***	-12.690***	0.289
CH CPI	84.743	84.080	106.800	68.629	12.543	0.268	1.550	25.074***	0.137	1.165	1.998
IND CPI	64.356	54.128	115.524	31.508	26.741	0.518	1.761	27.375***	1.275	3.030	1.963
CH IR	3.292	3.240	8.550	2.700	0.781	3.798	21.479	4191.271***	-8.410***	-8.967***	0.487
IND IR	7.048	6.500	11.000	6.000	1.256	0.924	2.659	37.059***	-2.915**	-3.198**	0.280
CH ER	7.169	6.897	8.310	6.051	0.749	0.126	1.512	23.900***	-1.073	-1.908	1.746
IND ER	48.979	45.477	70.363	35.810	8.684	0.812	2.312	32.678***	-0.722	-1.621	1.530

p < 0.05 and*p < 0.01.

Note: CH denotes China and IND indicates India.

Table-2. Quantile regression estimates for China during 1998-2008.

Variables	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	1.853	.632	-1.511	-2.978	-.798	-.984	-.973	-2.455	-3.780
	(0.442)	(0.789)	(0.501)	(0.134)	(0.626)	(0.535)	(0.596)	(0.241)	(0.402)
CPI	-.036**	-.023	.005	.023	.008	.009	.010	.0251*	.035
	(0.035)	(0.137)	(0.747)	(0.102)	(0.462)	(0.411)	(0.450)	(0.085)	(0.265)
IR	.005	.004	-.003	-.012	-.018	-.010	-.008	-.002	-.026
	(0.909)	(0.928)	(0.949)	(0.758)	(0.575)	(0.750)	(0.819)	(0.962)	(0.774)
ER	.046	.113	.127	.168	.034	.056	.056	.110	.213
	(0.784)	(0.491)	(0.414)	(0.223)	(0.764)	(0.607)	(0.661)	(0.446)	(0.496)

*p < 0.10, **p < 0.05 and ***p < 0.01.

Table-3. Quantile regression estimates for India during 1998-2008.

Variables	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	4.966	4.453**	5.074***	2.998*	1.982	.998	1.935*	2.412**	2.0209
	(0.181)	(0.031)	(0.001)	(0.051)	(0.174)	(0.370)	(0.083)	(0.010)	(0.161)
CPI	-.057**	-.0320**	-.033***	-.018	-.0115	-.003	-.012	-.016**	-.012
	(0.048)	(0.046)	(0.007)	(0.131)	(0.310)	(0.747)	(0.174)	(0.032)	(0.294)
IR	-.283*	-.221***	-.238***	-.133**	-.110*	-.055	-.081*	-.083**	-.050
	(0.077)	(0.013)	(0.000)	(0.044)	(0.080)	(0.254)	(0.091)	(0.038)	(0.414)
ER	-.025	-.043*	-.051***	-.031	-.015	-.008	-.015	-.021*	-.019
	(0.578)	(0.093)	(0.008)	(0.103)	(0.394)	(0.551)	(0.265)	(0.068)	(0.286)

*p < 0.10, **p < 0.05 and ***p < 0.01.

Table-4. Quantile regression estimates for China during 2009-2018.

Variables	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	-23.269 (0.880)	-11.948 (0.809)	26.999 (0.570)	47.860 (0.340)	37.576 (0.416)	51.026 (0.260)	80.231* (0.072)	105.566** (0.043)	92.802 (0.441)
CPI	.052 (0.872)	.025 (0.806)	-.0150 (0.879)	-.002 (0.982)	-.0519 (0.590)	-.100 (0.288)	-.195** (0.037)	-.180* (0.097)	-.354 (0.160)
IR	-.042 (0.998)	-.187 (0.976)	-4.638 (0.433)	-8.241 (0.187)	-3.052 (0.594)	-3.987 (0.477)	-8.371 (0.130)	-10.028 (0.121)	-3.234 (0.829)
ER	1.924 (0.894)	.887 (0.847)	-2.129 (0.631)	-3.609 (0.440)	-3.516 (0.414)	-4.241 (0.314)	-5.072 (0.220)	-8.199* (0.091)	-6.441 (0.566)

*p < 0.10, **p < 0.05 and ***p < 0.01.

Table-5. Quantile regression estimates for India during 2009-2018.

Variables	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	-4.771 (0.523)	-.788 (0.870)	.454 (0.915)	-.304 (0.936)	1.208 (0.747)	3.069 (0.397)	1.732 (0.576)	5.759 (0.160)	12.160** (0.048)
CPI	.101 (0.456)	.022 (0.799)	.026 (0.731)	.029 (0.669)	-.0187 (0.783)	-.037 (0.567)	-.097* (0.086)	-.149** (0.045)	-.251** (0.024)
IR	-.249 (0.748)	-.067 (0.894)	-.231 (0.597)	-.251 (0.522)	.030 (0.938)	.025 (0.947)	.061 (0.849)	-.098 (0.817)	-.406 (0.522)
ER	-.117 (0.686)	-.045 (0.811)	-.038 (0.817)	-.009 (0.953)	.036 (0.803)	.042 (0.764)	.172 (0.154)	.222 (0.164)	.344 (0.149)

*p < 0.10, **p < 0.05 and ***p < 0.01.

Table-6. Quantile regression estimates for China during 1998-2018.

Variables	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	-6.646 (0.530)	4.601 (0.610)	2.555 (0.735)	3.594 (0.594)	.593 (0.908)	-.673 (0.887)	-.946 (0.886)	1.602 (0.880)	40.346** (0.032)
CPI	-.091* (0.085)	-.106** (0.018)	-.063* (0.096)	-.031 (0.354)	.002 (0.932)	.027 (0.247)	.0515 (0.115)	.070 (0.183)	-.069 (0.457)
IR	-.052 (0.900)	.035 (0.920)	.030 (0.918)	-.026 (0.922)	-.038 (0.846)	-.024 (0.896)	-.001 (0.997)	.017 (0.967)	.024 (0.974)
ER	1.586* (0.069)	.330 (0.656)	.213 (0.732)	-.164 (0.766)	-.073 (0.860)	-.143 (0.714)	-.326 (0.546)	-.800 (0.358)	-4.263*** (0.006)

*p < 0.10, **p < 0.05 and ***p < 0.01.

Table-7. Quantile regression estimates for India during 1998-2018.

Variables	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	3.891	1.729	1.636	-.387	-1.598	-2.205**	-2.323*	-2.716*	.039
	(0.329)	(0.188)	(0.254)	(0.785)	(0.233)	(0.020)	(0.056)	(0.080)	(0.990)
CPI	-.061	-.029**	-.0142	.008	.0204	.026***	.042***	.061***	.097***
	(0.105)	(0.021)	(0.293)	(0.574)	(0.107)	(0.003)	(0.000)	(0.000)	(0.002)
IR	-.224	-.151	-.119	-.033	.063	.121	.126	.183	.097
	(0.539)	(0.209)	(0.363)	(0.798)	(0.608)	(0.162)	(0.255)	(0.196)	(0.743)
ER	-.007	.003	-.008	.007	.010	.010	.000	-.015	-.090
	(0.950)	(0.920)	(0.851)	(0.860)	(0.799)	(0.712)	(0.999)	(0.747)	(0.347)

*p < 0.10, **p < 0.05 and ***p < 0.01.

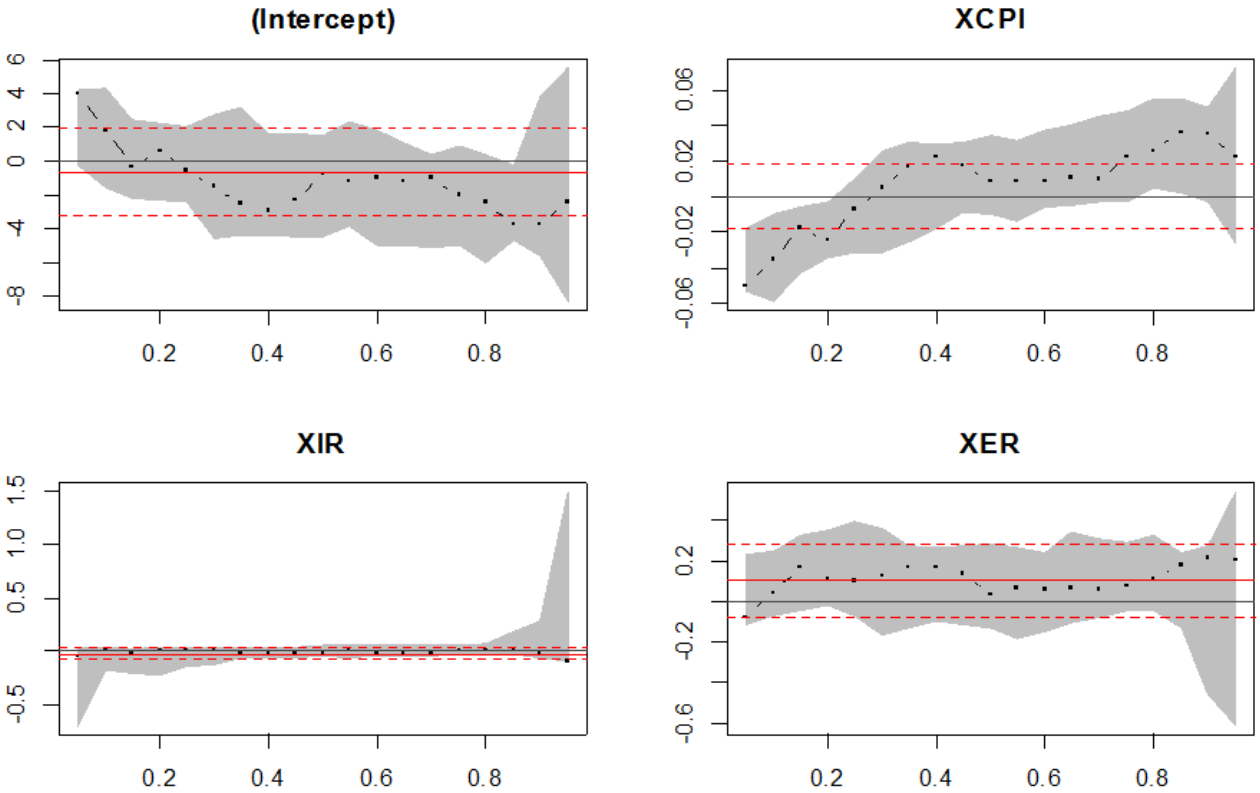

Figure-1. Changes in quantile regression coefficients for China during 1998-2008.

Note: *p < 0.10, **p < 0.05 and ***p < 0.01.

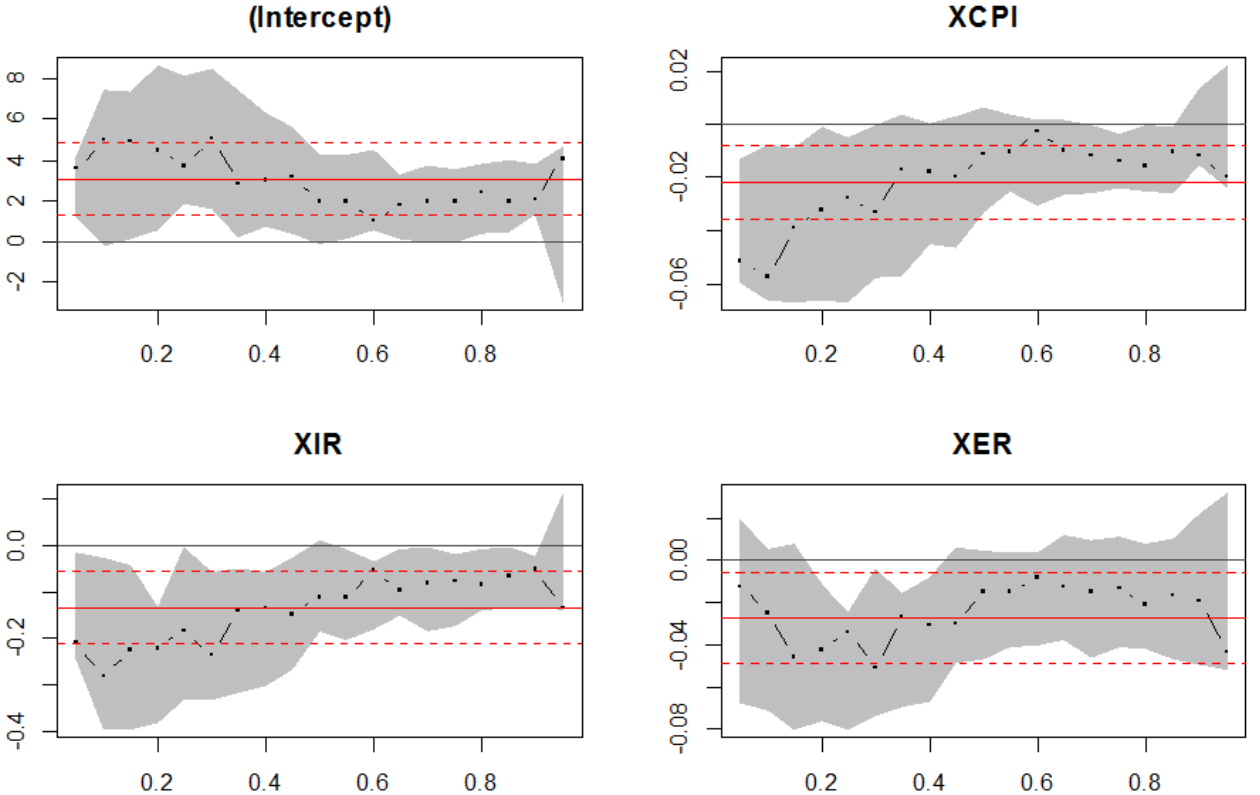

Figure-2. Changes in quantile regression coefficients for India during 1998-2008.

Note: *p < 0.10, **p < 0.05 and ***p < 0.01.

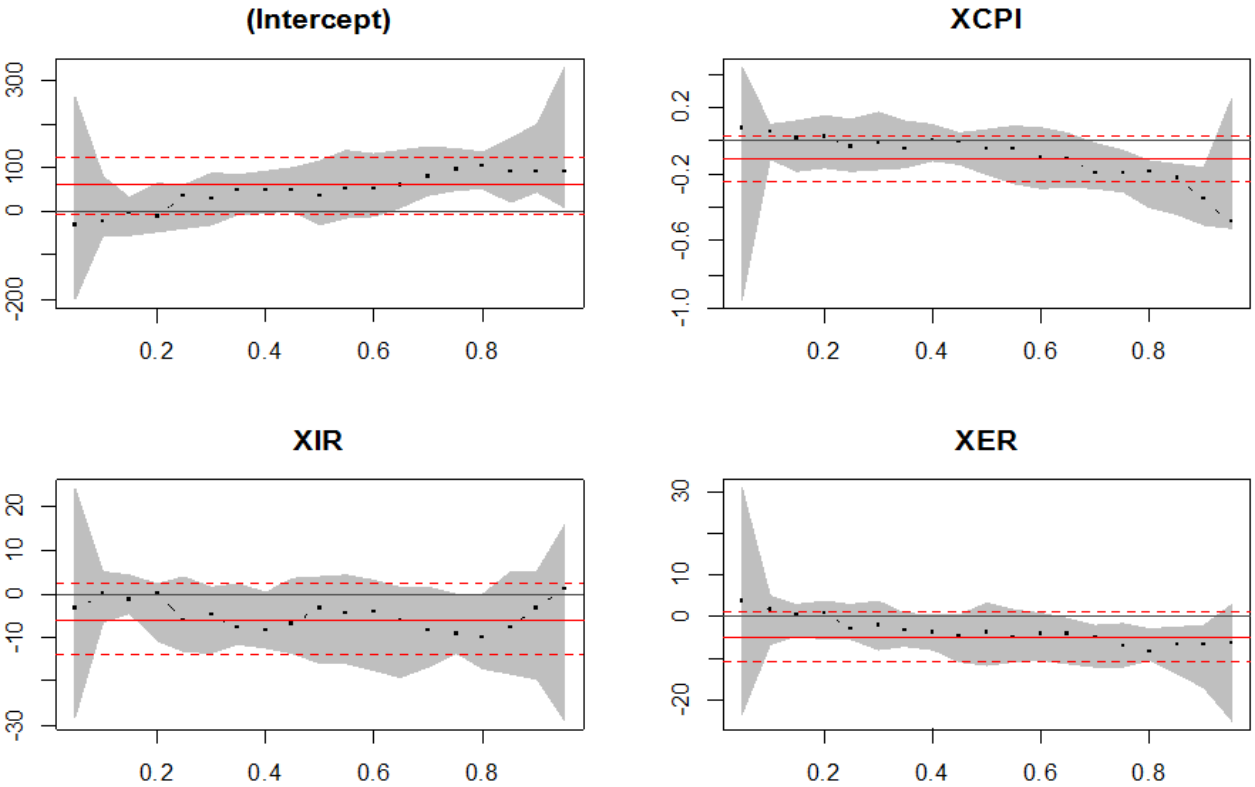

Figure-3. Changes in quantile regression coefficients for China during 2009-2018.

Note: *p < 0.10, **p < 0.05 and ***p < 0.01.

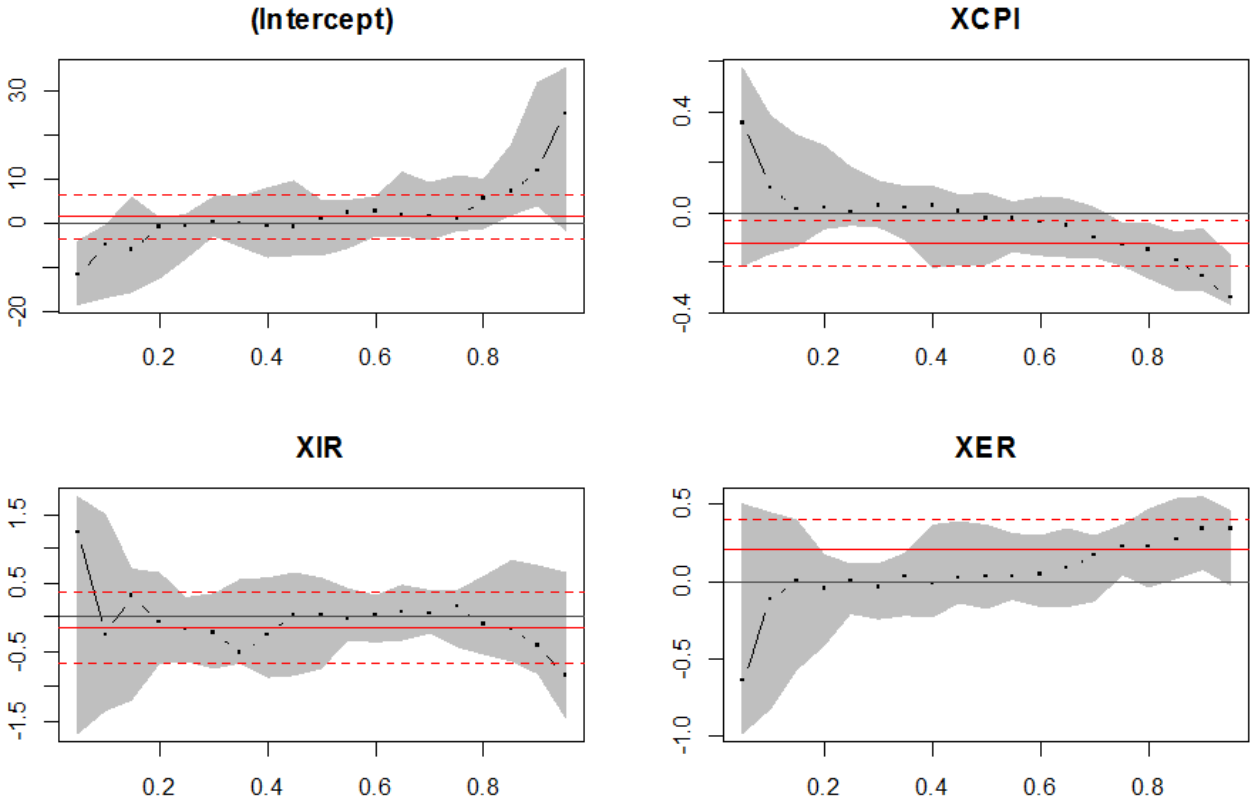

Figure-4. Changes in quantile regression coefficients for India during 2009-2018.

Note: *p < 0.10, **p < 0.05 and ***p < 0.01.

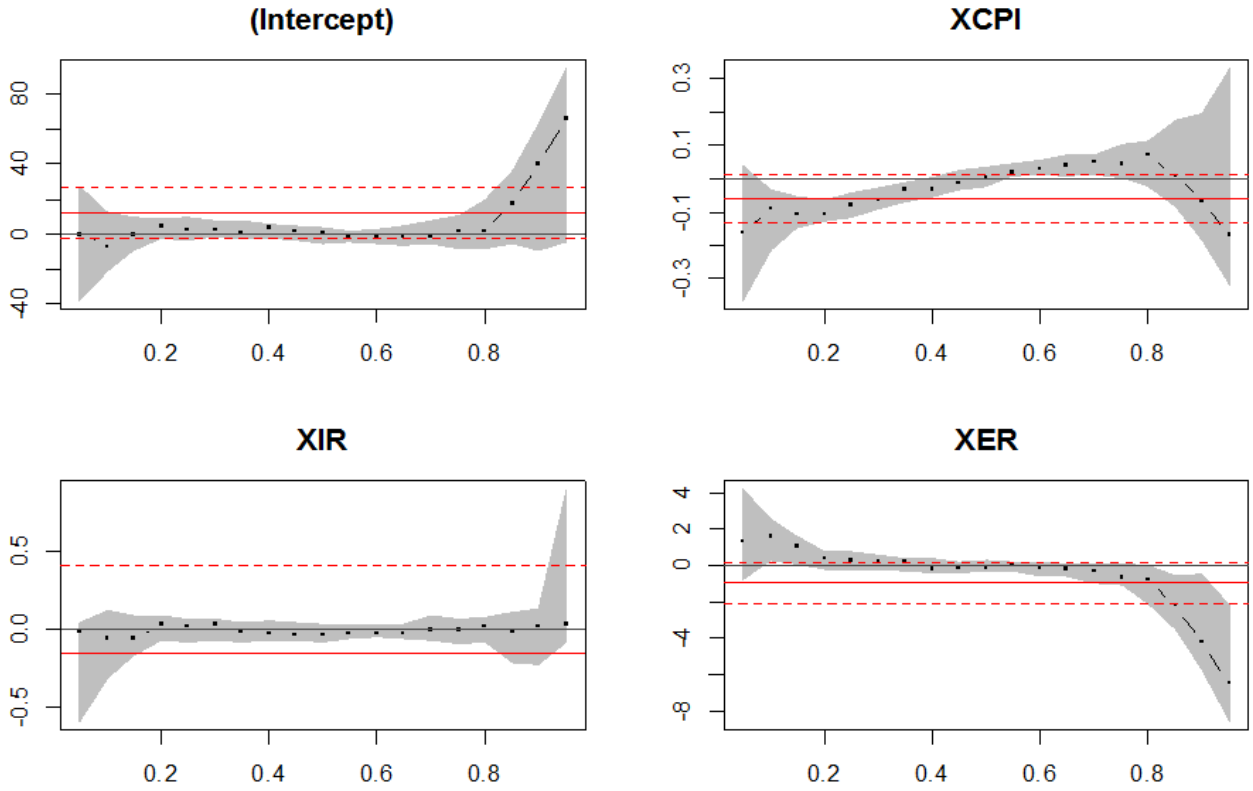

Figure-5. Changes in quantile regression coefficients for China during 1998-2018.

Note: *p < 0.10, **p < 0.05 and ***p < 0.01.

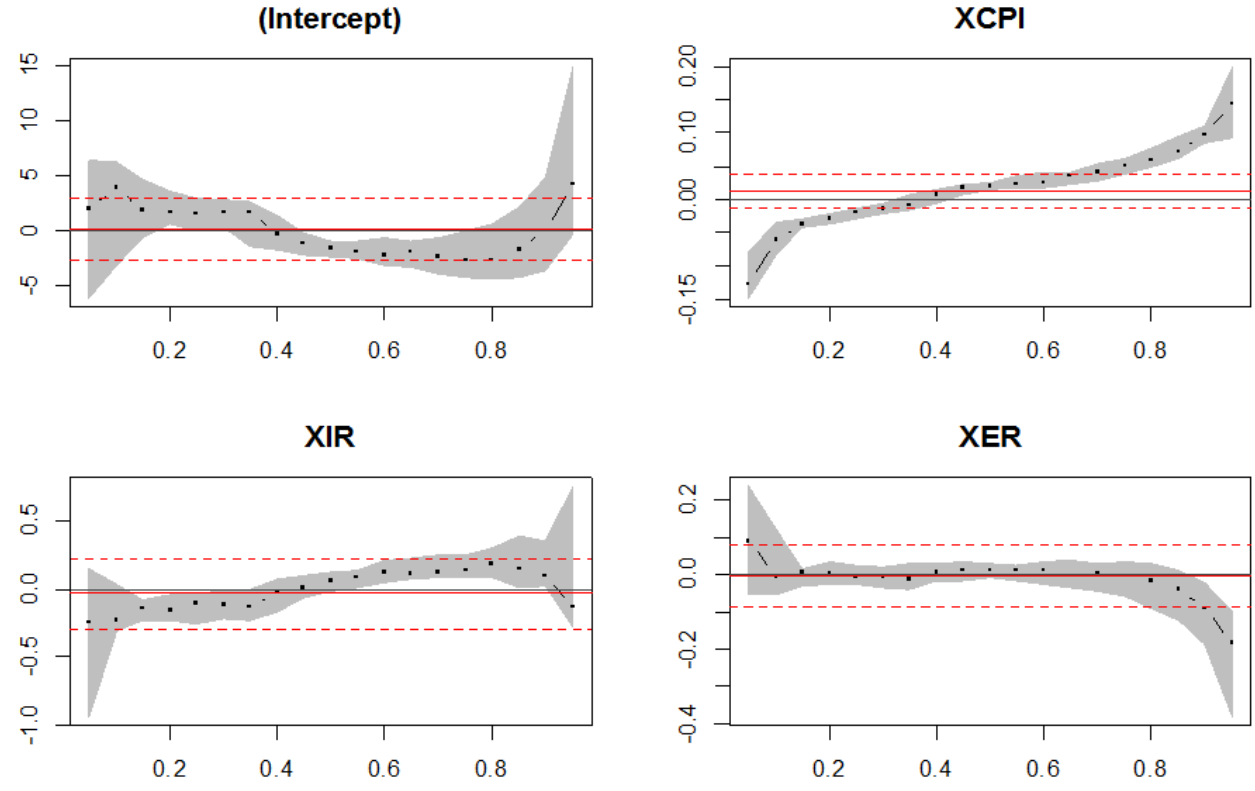

Figure-6. Changes in quantile regression coefficients for India during 1998-2018.

Note: *p < 0.10, **p < 0.05 and ***p < 0.01.

ER has a negligible impact on the Nifty returns for the 0.2 and 0.8 quantiles and a significant impact for 0.3 quantile. The sign of coefficients are negative, that is the Nifty returns increases when the Indian rupee appreciates against the US dollar and vice versa. When the quantile regression is evaluated for the 0.1, 0.4, 0.5, 0.6, 0.7 and 0.9,

the ER has an insignificant influence on the Nifty returns. It is significant to mention that the coefficients sign for all the variables are same (negative) across the different quantiles.

5.2. Dependence Structure between Stock Market Returns and Macroeconomic Factors during 2009-2018

In the case of China, CPI has a significant and negative influence on the SSE returns at the upper quantile (0.7 and 0.8 quantiles). In the case of IR, all quantile estimated coefficients found to be insignificant. Further, ER has a negligible negative impact on the SSE returns only at the 0.8 quantile that is the tail of the distribution, whereas, no significant effect is found for the lower and intermediate quantiles (Table 4 and Figure 3). It is observed that the sign of coefficients vary from quantile to quantile for CPI, IR and ER.

With regards to India, CPI has a significant impact on the Nifty returns only at the upper quantiles, but the impact is absent in intermediate and upper quantiles. This result implies the asymmetric dependence structure, having lower tail independence and upper tail dependence. In the case of IR, an insignificant impact is observed across the different quantiles. The Nifty return is not influenced by ER at lower, intermediate and upper quantiles that is appreciation or depreciation in the Indian rupee against the US dollar, which does not matter to impact the Nifty returns (Table 5 and Figure 4). The coefficients sign of all the three variables is not similar.

5.3. Dependence Structure between Stock Market Returns and Macroeconomic Factors during 1998-2018

Finally, the present study analyses the dependence for the entire period (1998-2018) and the results for China are demonstrated in Table 6 and Figure 5. The authors have observed that the coefficients of CPI, IR and ER show different sign across the quantiles. CPI has a significant and negative effect on the SSE returns only for the in lower quantiles and impact is absent for the intermediate and upper quantiles. This result is contradictory to the study of Soenen and Johnson (2001) that detects the positive impact of CPI on the stock market. This finding indicates the asymmetric dependence structure, having lower tail dependence and upper tail independence. Further, IR does not affect SSE returns. ER has an impact on the SSE returns at the extreme dataset that is 0.1 and 0.9 quantiles. Thus, there is tail dependence, meaning that extreme movements in ER have an impact on the SSE returns.

In the case of India, the results for the entire period are depicted in Table 7, and Figure 6 discloses that CPI is positive with a high degree of significance for the upper quantiles. This result would be in accordance with Pal and Mittal (2011); Patel (2012). However, except for 0.2 and 0.6 quantiles, the impact is not significant in lower and intermediate quantiles. Further, IR does not affect Nifty returns. Similarly, the authors notice an insignificant impact of ER on the Nifty returns across the quantiles. This finding is consistent with Pal and Mittal (2011). Similar to SSE, the sign of coefficients for Indian factors also alter from quantile to quantile.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In this paper, the authors analyse how the Chinese and Indian macroeconomic factors influence their respective stock markets. Our results show that during 1998-2018, Chinese CPI is significant to affect the SSE returns only in lower quantiles. However, Indian CPI has a significant positive impact on the Nifty returns in the upper quantiles. Moreover, Chinese IR and Indian IR fail to affect the SSE and Nifty returns, respectively in any quantile. Chinese ER has an impact on the SSE returns at the extreme dataset. In contrast, Indian ER has no significant impact on the Nifty returns. There is negligible change in the dependence structure for China during the post-recession period. On the other hand, there is a significant change in dependence structure post-recession for India. This research is particularly helpful for investors and portfolio risk managers for investing money in Chinese and Indian stock markets.

It is important to note that this paper is the first attempt of addressing this issue using QR methodology. However, this study can be further extended to other macroeconomic variables. Another possible extension of this

study is to compare China and India with developed nations. Finally, the next line of research is comparison of these two markets only with other emerging economies.

6.2 Recommendations

The results for the entire period reveal that the SSE returns are less sensitive to CPI and ER. Therefore, it is advised that investors should invest in the Chinese stock market carefully using the CPI and the ER. In contrast to these results, the SSE returns are not sensitive to IR. Hence, stock market participants should not follow IR while investing in the China stock market.

On the basis of results for the entire period, the study has found strong evidence that the Nifty returns are most sensitive to CPI. Therefore, if investors want to earn returns and reduce risk created by macroeconomic factors, they should consider the CPI. Further, the Nifty returns are not sensitive to IR and ER. Thus, investors should avoid investing in the Indian stock market using IR and ER.

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REFERENCES

Ashwani and V.P. Sheera, 2018. Indian stock market volatility and economic fundamentals: MIDAS approach. Indian Journal of Finance, 12(8): 7–21.Available at: https://doi.org/10.17010/ijf/2018/v12i8/130741.

Bhuvaneshwari, D. and K. Ramya, 2018. Can select macroeconomic variables explain long-run price movements of Indian stock indices? Indian Journal of Research in Capital Markets, 5(1): 35–53.

Brooks, C., 2014. Introductory econometrics for finance. Cambridge, UK: Cambridge University Press.

Buchinsky, M., 1995. Estimating the asymptotic covariance matrix for quantile regression models a Monte Carlo study. Journal of Econometrics, 68(2): 303-338.Available at: https://doi.org/10.1016/0304-4076(94)01652-G.

Cai, Y., R.Y. Chou and D. Li, 2009. Explaining international stock correlations with CPI fluctuations and market volatility. Journal of Banking & Finance, 33(11): 2026-2035.Available at: https://doi.org/10.1016/j.jbankfin.2009.05.013.

Chen, M.-H., 2007. Macro and non-macro explanatory factors of Chinese hotel stock returns. International Journal of Hospitality Management, 26(4): 991-1004.Available at: https://doi.org/10.1016/j.ijhm.2006.04.002.

Das, A. and A.V. Megaravalli, 2017. Macroeconomic indicators and stock market boogie: The case of national stock exchange, India. Indian Journal of Research in Capital Markets, 4(3): 20-32.Available at: https://doi.org/10.17010/ijrcm/2017/v4/i3/118913.

Dimitriou, D., D. Kenourgios and T. Simos, 2013. Global financial crisis and emerging stock market contagion: A multivariate FIAPARCH–DCC approach. International Review of Financial Analysis, 30: 46-56.Available at: https://doi.org/10.1016/j.irfa.2013.05.008.

Gebka, B. and M.E. Wohar, 2013. Causality between trading volume and returns: Evidence from quantile regressions. International Review of Economics and Finance, 27: 144-159.Available at: https://doi.org/10.1016/j.iref.2012.09.009.

Hosseini, S.M., Z. Ahmad and Y.W. Lai, 2011. The role of macroeconomic variables on stock market index in China and India. International Journal of Economics and Finance, 3(6): 233-243.Available at: https://doi.org/10.5539/ijef.v3n6p233.

Jareño, F., R. Ferrer and S. Miroslavova, 2016. US stock market sensitivity to interest and inflation rates: A quantile regression approach. Applied Economics, 48(26): 2469-2481.Available at: https://doi.org/10.1080/00036846.2015.1122735.

Koenker, R. and G. Bassett, 1978. Regression quantiles. Econometrica, 46(1): 33–50.Available at: https://doi.org/10.2307/1913643.

Lao, P. and H. Singh, 2011. Herding behaviour in the Chinese and Indian stock markets. Journal of Asian Economics, 22(6): 495-506.Available at: https://doi.org/10.1016/j.asieco.2011.08.001.

Mensi, W., S. Hammoudeh, J.C. Reboredo and D.K. Nguyen, 2014. Do global factors impact BRICS stock markets? A quantile regression approach. Emerging Markets Review, 19(C): 1-17.Available at: https://doi.org/10.1016/j.ememar.2014.04.002.

Minh, P.T., T.T. Trang, P.N. Bao, L.D. Toan and V.H. Diem, 2019. The relationship between risk and return - an empirical evidence from real estate stocks listed in Vietnam. Asian Economic and Financial Review, 9(11): 1211–1226.Available at: https://doi.org/10.18488/journal.aefr.2019.911.1211.1226.

Mitra, P.K., 2018. Nexus between crude oil and stock market return: Case of India. Asian Journal of Empirical Research, 8(4): 140–149.Available at: https://doi.org/10.18488/journal.1007/2018.8.4/1007.4.140.149.

Mosteller, F. and J.W. Tukey, 1977. Data analysis and regression: A second course in statistics. Addison-Wesley Series in Behavioral Science: Quantitative Methods. New York: Addison-Wesley.

Ni, Z.X., D.Z. Wang and W.J. Xue, 2015. Investor sentiment and its nonlinear effect on stock returns-New evidence from the Chinese stock market based on panel quantile regression model. Economic Modelling, 50: 266–274.Available at: https://doi.org/10.1016/j.econmod.2015.07.007.

Pal, K. and R. Mittal, 2011. Impact of macroeconomic indicators on Indian capital markets. The Journal of Risk Finance, 12(2): 84-97.Available at: https://doi.org/10.1108/15265941111112811.

Pani, S.K., R. Bhatt and G. Himatsingka, 2019. The effects of economic and political events on the movements of BSE sensex: A study of outliers from 1991 to 2014. Finance India, 33(2): 407–422.

Patel, S., 2012. The effect of macroeconomic determinants on the performance of the Indian stock market. NMIMS Management Review, 22(8): 117–127.

Samitas, A., D. Kenourgios and N. Paltalidis, 2007. Financial crises and stock market dependence. Available from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.470.4101&rep=rep1&type=pdf.

Sengupta, S., A. Dutta and A. Dutta, 2019. An empirical study of the effect of macro- economic factors on the stock market: An Indian perspective. Finance India, 33(1): 113–134.

Singhania, K. and G.P. Girish, 2015. Impact of macroeconomic events on Shanghai stock exchange. Asian Journal of Empirical Research, 5(6): 64–76.Available at: https://doi.org/10.18488/journal.1007/2015.5.6/1007.6.64.76.

Soenen, L. and R. Johnson, 2001. The interrelationship between macroeconomic variables and stock prices-the case of China. Journal of Asia-Pacific Business, 3(2): 67-81.Available at: https://doi.org/10.1300/j098v03n02_04.

Statistics FRED, 2018. Federal reserve economic data. Available from https://fred.stlouisfed.org/.

Statistics Yahoo Finance, 2018. Yahoo finance. Available from https://in.finance.yahoo.com/.

Sudharshan, P.R., R. Gupta, S. Maheshwari and V. Nagar, 2016. The empirical relationship between the value of rupee and performance of information technology firms: Evidence from India. International Journal of Business and Globalisation, 16(4): 512-529.

Xu, H. and S. Hamori, 2012. Dynamic linkages of stock prices between the BRICs and the United States: Effects of the 2008–09 financial crisis. Journal of Asian Economics, 23(4): 344-352.Available at: https://doi.org/10.1016/j.asieco.2012.04.002.