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# *Impact of US Economic Policy Uncertainty on Geopolitical Risk. Evidence from BRIC Economies*

**SUMMARY:** This paper estimates the relationship between US economic policy uncertainty and geopolitical risk in the BRIC economies.<sup>1</sup> Due to the assumption of a non-linear and asymmetric relation between US economic policy uncertainty and geopolitical risk of BRIC countries, a nonparametric estimation technique, Quantile on Quantile approach has been used for empirical analysis. The empirical results revealed that the relationship between the US economic policy uncertainty and geopolitical risk of BRIC economies is heterogeneous in nature. We noted that economic policy uncertainty in the US is negatively related to geopolitical risk in Chinese and Russian economies. However, for Indian and Brazilian economies US economic policy uncertainty is positively related to geopolitical risk. The outcomes of the study will be helpful for the investors and financial market players for taking investment decisions. It will also benefit the legislators and policymakers in making policies that could make their respective economies insulated from foreign policy risks.

**KEYWORDS:** economic policy uncertainty, geopolitical risk, quantile on quantile approach, BRIC economies

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The world, nowadays, is facing greater deal of political and economic upheaval. Events like changing alliances in the Middle-East, the expansion of China, shock to the European Union like Brexit, *Trump's* administration in the US and the military turmoil in different parts of the world like Syria, Ukraine, etc. have peaked up the risk of social and political unrest in the world. These political and social

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uncertainties pose a risk to the economy commonly regarded as the 'Geopolitical Risk' (GPR). Geopolitical risk is becoming a major concern for business and financial markets all over the world. The global investor's survey, (2018) conducted by PricewaterhouseCoopers (PwC) says that 40 percent of the CEOs and 39 percent of investment professionals regarded geopolitical risk as one of the biggest threats to the growth of businesses and investments.

Geopolitical risks serve as the key determinants for making investment decisions by the market participants, entrepreneurs,

and the central bank's officials. It has also been highlighted as a threat to the economic outlook by the International Monetary Fund and European Central Bank (Caldara and Iacoviello, 2018). The returns on investments largely suffer due to the political changes or instability in the country. These instabilities could stem out of the changes in the governments, legislation, foreign policies or greater military power. The effect of geopolitical risks increases as the time horizon is prolonged. *Carney* (2016) included geopolitical risk in the 'uncertainty trinity' along with the economic and policy uncertainty and argued that geopolitical uncertainty could have severe economic impacts.

If an economy is facing geopolitical risk, it makes it greatly fragmented and unstable, because of which businesses also manifest fluctuations. Stating as a general principle, if a country is moving on an upward trajectory of growth and its future is prosperous and essentially predictable, investors will be keen on investing in such economy. However, unexpected events such as wars, military assaults, and political regime instability, etc. increase the risks associated with investments and investors hesitate in investing in economies where these kinds of risks prevail. With the greater extent of globalization and interconnectedness of markets across the globe, viewing geopolitical risk as a potential risk for the financial markets has become vital than ever.

Over the past three decades, the world has witnessed a substantial increase in the number of the sovereign actors whose decisions can have positive or negative effects on the world economy. All of these new actors are mutually regarded as 'emerging economies'. The emerging market economies have an important place because they are the major drivers of growth for the global economy and are also serving as an economic and

financial opportunity for the businesses and investors. Emerging markets used to be an obscure niche for the investors in later times. However, they are now, regarded as 'potential hub' for future investments by the global investors. These rapidly growing countries are playing a critical role in the global economic system. Almost half of the global economic growth lies with the emerging markets. It is being said that if the investors diversify their portfolios by adding the stocks of these economies in their portfolios, they will be able to maximize their long-run returns and will also be able to diversify the risk. In a similar way, the importance of the US economy in the world can also not be negated. The US is the world's largest economy, accounting for the almost a quarter of the world's GDP. It is the most important export destination for almost one-fifth of the countries around the globe. Any policy changes in the US are a major determinant of investors' sentiments and global financing conditions. Given the dominance of the US economy in the global paradigm, any uncertainty in the US political and economic environment can lead to volatility in the emerging economies. It is strongly argued by the policymakers and academicians alike that US economic policy uncertainty (EPU) has strong spillover effects on emerging markets, because of the greater interconnectedness among these economies and their financial markets.

In most of the past literature that has used the uncertainty measures, these studies correlated own country's uncertainty with its stock returns. However, the literature contains some exceptions such as *Mensi et al.* (2014, 2016), *Balcilar et al.* (2015), etc. These studies employed the conventional mean-based vector autoregression (VAR) models or cross-correlation functions, quantile regressions or quantile causality approach to examine the relationship between US uncertainties with

the emerging stock markets, where, VAR and quantile regressions manifested insignificant results, (see for example, Sum, 2012a,b) and quantile causality providing evidence of strong spillover effects from US uncertainty to the financial markets of developing countries (see for instance, Balcilar, et al. 2015). Following this notion, one exception is the study of *Chulia et al.* (2017), who studied the impact of US economic policy uncertainty on stock returns of emerging and developed markets of the world using nonparametric Quantile Vector Auto-Regressive Approach. The study found evidence of the significant negative impact of the US policy uncertainty on stock returns of emerging financial markets especially during the times of financial distress and gave the evidence of spillover effects of US economic policy uncertainty on the stock returns of emerging and developed markets. Another study was conducted by Balcilar et al. (2018) to assess the impact of geopolitical risk on the stock market dynamics of BRICS economies using nonparametric causality in quantile approach, and noted a nonuniform response of BRICS stock market to the geopolitical risk. This study, though, has an important contribution in the finance literature as it documents the evidence of causal relationship between geopolitical risk and stock market returns, but, it does not provide with the information of sign and persistence of the influence for variables in question which is a major drawback of quantile causality approach. Looking at the results of these studies raises the question that if US economic policy uncertainty and own country geopolitical risk can cause volatility in the financial markets, is there any relationship between these two measures? It is important to explore this side of the relationship because of two reasons. Firstly, past literature has provided the evidence that US economic policy uncertainty has contagious effects for

the emerging economies' stock markets and secondly, the volatility in the stock markets of emerging economies may also stem from the geopolitical risks in the economy.

The structural changes in the economic policy of countries have always been a grave concern for the policy makers and economists. The reason is, the economic and financial system upheavals in one country can easily be transmitted to other countries. Moreover, its effects can be of greater magnitude when they originate from the leading economies of the world, (Forbes & Chinn, 2004; Sum, 2012). One of the example of such contagion effect is the financial downturn in the US, commonly known as the global financial crisis of 2007-08. The financial crisis though started from the U.S., however, its contagious effects were experienced by various economies of the world, (Dakhlaoui and Aloui, 2014). The complexity of the crisis stemmed from the US housing market which then affected the financial market of the US and the rest of the world specifically the emerging and frontier economies, (Bianconi et. al., 2013).

Using the background of the studies cited above, the objective of the following study is to use to examine the impact of US policy uncertainty on the geopolitical risk of emerging economies of Brazil, Russia, India, China and South Africa (BRICS)<sup>2</sup>. The outcomes of the study will be helpful for the investors and financial market players for taking investment decisions. It will also benefit the legislators and policymakers in making policies that could make their respective economies insulated from foreign policy risks.

We have chosen Quantile on Quantile Approach (henceforth QQ Approach) to investigate the relationship between the said variables. This choice has been made considering asymmetric nature of the variables in question. QQ Approach helps us to obtain a more comprehensive explanation of the

relationship between variables by examining the tails of distribution of both dependent and independent variables. By using the QQ approach, we are able to model the quantile of GPR (and its various frequencies) as a function of the quantiles of US EPU, so that the linkage between these variables could vary at each point of their respective distributions and provide a complete picture of the dependence. Furthermore, due to its assumption of a non-linear and asymmetric relation between variables, QQ approach is the most suitable methodology for the given study. To the best of our knowledge, this is the first study that uses the QQ approach to study the effect of US policy uncertainty on the geopolitical uncertainty of the emerging markets.

The rest of the paper is organized as follows: Section-II briefly describes the data and the methodology. Section- III discusses the empirical results. Section-IV presents conclusion with policy implications.

## DATA AND METHODOLOGY

Uncertainty is inherently an intrinsic variable. Hence, getting a suitable measure for it is not a straightforward task. For quantifying the relationship between uncertainty and other variables, past studies have used two measures, either the news based approach or to calculate uncertainty using the stochastic volatility in the error terms of the estimated structural VAR models. However, the news based approach, proposed by *Baker et al.* (2016) for economic policy uncertainty and *Caldara and Iacoviello*, (2018), for the geopolitical risk seems to be more popular than the later one and has been used in various studies of macroeconomics and financial literature (Raza et al. 2018, Chulia et al. 2017, Balcilar et al. 2018 etc.).

The current study also uses the same approach and employs the news based uncertainty

measures to estimate the relationship between US economic policy uncertainty and geopolitical risk in the BRICS economies. The data on EPU and GPR measures are retrieved from the policy uncertainty website.<sup>3</sup> We have used monthly data for the time period spanning from January 1985 to February 2018 for both uncertainty measures and calculated the log returns for both the measures.

The EPU index developed by Baker et al. (2016) employs the archives of leading newspapers from Access World New's NewsBank Service. To calculate the following index, the news articles are searched for at least one term from 3 given sets of terms including economy or economic, uncertain or uncertainty, Federal Reserve, deficit, Congress, legislation and White House. The frequencies of the terms are then standardized to formulate the index. With the same approach, *Caldara and Iacoviello*, (2018) calculated geopolitical risk index by using an algorithm to count the frequencies of the articles pertaining to geopolitical risk in the 11 leading newspapers published in the U.S. The search basically identifies six groups of words including geopolitical, military turmoil, nuclear tensions, war or terrorist threats, or adverse geopolitical events that can lead to uncertainty like terrorist assaults or beginning of the war. The values are then normalized to an average value of 100 in the 2000-2009 decade to formulate the index.

The Quantile on Quantile approach (QQ) developed by *Sim and Zhou*, (2015) is the generalized specification of standard quantile regression model, where one can assess the effects of quantiles of one variable on the conditional quantiles of the other variable. The QQ method is a combination of a quantile regression, where the impact of an exogenous variable on the quantiles of the dependent variable is checked and local linear regression, which is used to assess the local effect of a specific quantile of

the exogenous variables on the dependent variable. For constituting the framework of the following study, the QQ methodology has been employed to examine and assess the impact of quantiles of the economic policy uncertainty of US on the quantiles of the geopolitical risk of the emerging economies. The following non-parametric quantile regression is used as the starting point:

$$GPR_t = \beta^\theta(EPU_t) + u_t^\theta \tag{1}$$

Here,

the  $GPR_t$  denotes the geopolitical uncertainty index of a given emerging economy in a specific time period  $t$ ,

$EPU_t$  shows the weighted index of economic policy uncertainty in the US in a given time period  $t$ ,

$\theta$  is the  $\theta$ th quantile of the of the conditional distribution of the geopolitical uncertainty in the emerging market economies and

$u_t^\theta$  is the quantile error term with conditional  $\theta$ th quantile equal to zero.

$\beta^\theta$  is an unknown parameter as we do not have prior information about the relationship between economic policy uncertainty of US and geopolitical uncertainty of the emerging market economies.

The quantile regression models the impact of economic policy uncertainty of US on the geopolitical risk of the emerging markets while allowing the effect of economic policy uncertainty to vary across different quantiles of geopolitical risk. The benefit of using this approach is its flexibility as no hypothesis has been developed related to the functional form of the relationship between EPU of US and GPR of the emerging economies. However, this approach has a disadvantage as it does not have the ability to assess the dependence structure in its entirety. Hence, the quantile regression does not account for the possibility that the nature of economic policy shocks may

also affect the manner in which the economic policy uncertainty and geopolitical risk are linked together. For instance, the impact of large policy shifts can have a greater impact on the geopolitical uncertainty than the smaller policy changes. Moreover, it is quite probable that geopolitical risk reacts asymmetrically to positive and negative policy changes in the US.

Therefore, to assess the impact on the  $\theta$ th quantile of GPR of the emerging economies and  $\tau$ th quantile of EPU in US the, expressed as,  $EPU^\tau$ , the equation-1 is analyzed in the neighborhood of  $EPU^\tau$ , using local linear regression. Since,  $\beta^\theta$  is an unknown parameter, the equation-1 can be approximated by a first order Taylor expansion around a quantile  $EPU^\tau$ , so equation (1) is transformed as following:

$$\beta^\theta(EPU_t) \approx \beta^\theta(EPU^\tau) + \beta^{\theta'}(EPU^\tau)(EPU_t - EPU^\tau) \tag{2}$$

Here,  $\beta^\theta$  is the partial derivative of  $\beta^\theta(EPU_t)$  with respect to EPU and can also be said as marginal response. It is interpreted as the slope coefficient of the standard linear regression model.

The main advantage of equation-2 is that the parameters  $\beta^\theta(EPU^\tau)$  and  $\beta^{\theta'}(EPU^\tau)$  are function of a both  $\theta$  and  $\tau$ , as  $\beta^\theta(EPU^\tau)$  and  $\beta^{\theta'}(EPU^\tau)$  are functions of  $\theta$  and  $EPU^\tau$  is a function of  $\tau$ . Therefore,  $\beta^\theta(EPU^\tau)$  and  $\beta^{\theta'}(EPU^\tau)$  can be renamed as  $\beta_0(\theta, \tau)$  and  $\beta_1(\theta, \tau)$  respectively. So, equation-2 can be transformed as following:

$$\beta^\theta(EPU_t) \approx \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(EPU_t - EPU^\tau) \tag{3}$$

After substituting equation-3 in equation-1, equation-1 becomes as following:

$$GPR_t = \underbrace{\beta_0(\theta, \tau) + \beta_1(\theta, \tau)(EPU_t - EPU^\tau)}_{(*)} + u_t^\theta \tag{4}$$

The (\*) part of equation-4 is basically the  $\theta$ th conditional quantile of GPR of the emerging economies and shows the relation

between the  $\theta$ th quantiles of GPR of emerging markets and  $\tau$ th quantile of the EPU of US as the parameters  $\beta_0$  and  $\beta_1$  are dual function of  $\theta$  and  $\tau$  and these parameters may vary across different  $\theta$ th quantiles of GPR and  $\tau$ th quantile of the EPU. Furthermore, the QQR approach assumes a linear relationship between the quantiles of variables in question in no point of time. Hence, equation-4 assesses the overall dependence structure between the EPU of US and GPR of the emerging market economies using the dependence between their quantile distributions.

To empirically estimate equation-4, have to be replaced with their estimated counterparts i.e.,  $\widehat{EPU}_i$  and  $\widehat{EPU}^\tau$ , respectively. To obtain the local linear regression estimates of the parameters  $b_0$  and  $b_1$ , which are the empirical estimates of  $\beta_0$  and  $\beta_1$ , following minimization function has to be solved:

$$\min_{b_0, b_1} \sum_{i=1}^n \rho_\theta [GPR_i - b_0 - b_1(\widehat{EPU}_i - \widehat{EPU}^\tau)] \times \times K \left( \frac{F_n(\widehat{EPU}_i - v)}{h} \right) \quad (5)$$

Here,  $\rho_\theta(u)$  is the quantile loss function and can be defined as,  $\rho_\theta(u) = u[\theta - I(u < 0)]$  where  $I$  is the usual indicator function,  $K(\cdot)$  shows the kernel function and  $h$  is the bandwidth parameter of the kernel. The following study employs Gaussian kernel. It is widely used kernel function in financial and economic literature due its efficiency and simplicity. It is used to weight the data points in the neighborhood of  $\widehat{EPU}^\tau$ . The Gaussian kernel has symmetrical distribution around zero and assigns low weights to the farther away observations. For the given study, we assume these weights to be inversely related to the distance between the empirical distribution function of  $\widehat{EPU}_i$  and can be represented by,  $F_n(\widehat{EPU}_i) = \frac{1}{n} \sum_k I(\widehat{EPU}_k < \widehat{EPU}_i)$  and the value of the distribution function corresponding to the quantile  $\widehat{EPU}^\tau$  is shown by  $\tau$ .

Choosing the bandwidth is a critical task while using non-parametric estimation techniques. It determines the size of the neighborhood surrounding a specific data point and therefore controls the smoothness of resulting estimates. While a larger bandwidth corresponds to the greater probability of bias in the estimates, a smaller bandwidth may result in a greater variance. Therefore, the bandwidth should be selected as such that a balance between bias and variance may be maintained. Following *Sim and Zhou* (2015), a bandwidth parameter  $h=0.05$  is used in the study.

## DESCRIPTIVE STATISTICS

*Table 1* reports the summary statistics of the variables. Panel A shows the results of USEPU. The mean value of the USEPU returns is 0.0002 with a minimum value of -0.9188 and maximum value of 0.252. The value of JB statistics is 113.66 with a prob. Value of 0.000, which shows that the log return series of USEPU is non normal.

Panel 2 of *Table 1* shows the descriptive statistics of geopolitical risk returns of BRIC countries. The mean values of GPR series are -0.0012, -0.0006, -0.0002 and 0.0004 for Brazil, Russia, India and China, respectively. Moreover, while Brazil being an exception, we observe that the log return series of the variables show non-normal distributions and hence provide a motivation to use QQ approach to accommodate the heavy tails.

## EMPIRICAL RESULTS

The QQ figures for the relationship between quantile of GPR of BRIC economies and  $\tau$ th quantile of EPU of US are presented in Panel (A) to (D) of *Figure 1*. The response of

Table 1

DESCRIPTIVE STATISTICS OF RETURN SERIES								
Country	N	Mean	S. D.	Min	Max	Skewness	Kurtosis	JB
<b>Panel A: Log Returns of USEPU</b>								
USEPU	397	0.0002	1.076	-0.9188	0.252	0.679	5.241	113.66***
<b>Panel B: Log Return of BRIC GPR</b>								
Brazil	397	-0.0012	0.782	-0.905	0.276	-0.010	3.085	0.128
Russia	397	-0.0006	1.019	-0.641	0.214	0.386	4.489	46.585***
India	397	-0.0002	1.164	-0.641	0.221	0.714	5.576	143.562***
China	397	0.0004	0.560	-0.485	0.184	0.272	3.212	5.677**

Note: The asterisks \*\*\* and \*\* represent significance at the 1% and 5% levels, respectively.

Source: own calculations

geopolitical risk of BRIC economies to economic policy uncertainty of US is heterogeneous in nature, implying that, economic policy uncertainty of US do not affect the geopolitical risk of BRIC economies in a uniform way. Panel (A) and (B) represents the results for China and Russia. These economies share some commonalities in the association between the respective economies' geopolitical risk and economic policy uncertainty of US. For China, a negative correlation is being observed in almost all combinations of quantiles of US and GPR of China. Russia has also broadly confirmed the similar trend in results. In most of the combinations of quantiles of US EPU and GPR of Russia, the correlation is negative. This implies that apparently an economic policy shift in the US does not produce accentuated movement in the geopolitical risk of China and Russia. Therefore, the economic policy uncertainty of US cannot be regarded as a driving force for the geopolitical risk in these economies.

However, Brazil and India have shown quite contradictory results. Panel (C) and (D) of Figure 1 represent results for these economies. Looking at the results, we found that US

economic policy uncertainty has a relatively stronger impact on the geopolitical risk of Brazil and India. The relationship between US EPU and GPR of Brazil and India is positive for a vast majority of the combinations of quantiles. Due to the positive interdependence between the policy uncertainties, the US EPU may trigger geopolitical uncertainty in the Brazilian and Indian economy.

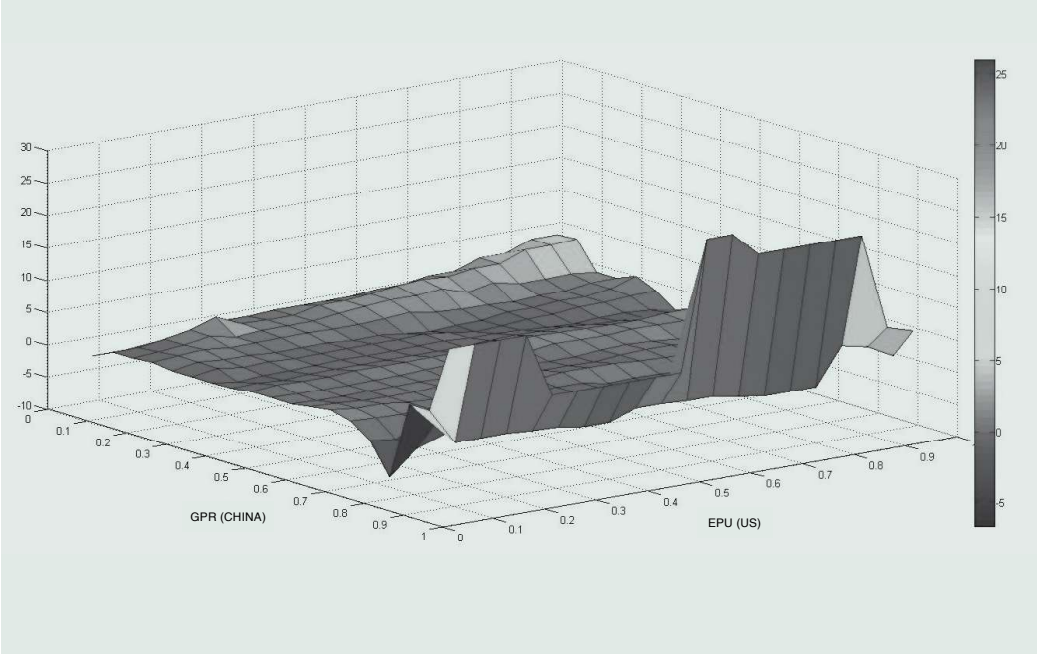
## CONCLUSION AND POLICY IMPLICATIONS

Geopolitical risk is one of the main determinant of taking investments and business decisions. The increasing geopolitical uncertainties in the world have amplified the impact of risk associated with it. Geopolitical risk does not only have the ability of disturbing the overall economic outlook but it is also a cause of bringing about volatility in the stock returns. Similarly, the importance of economic policy uncertainty in the global economic dynamics should not be ignored. After the global financial crisis, a large part of economic and finance literature focused on the impact of

Figure 1

ESTIMATES OF QUANTILE ON QUANTILE APPROACH

Panel (A): China



Panel (B): Russia

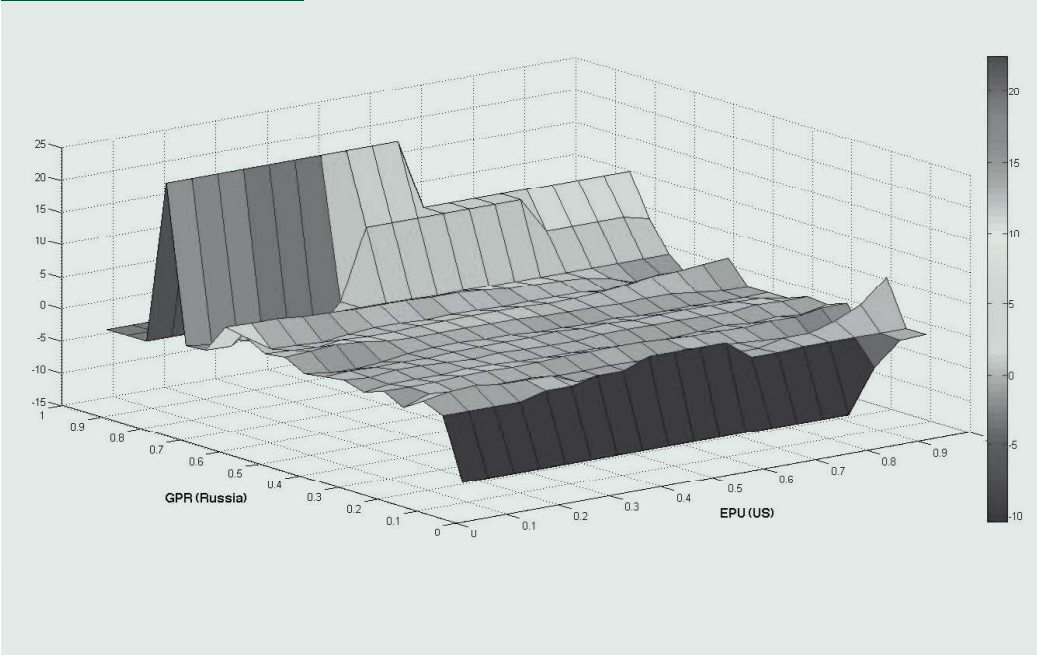
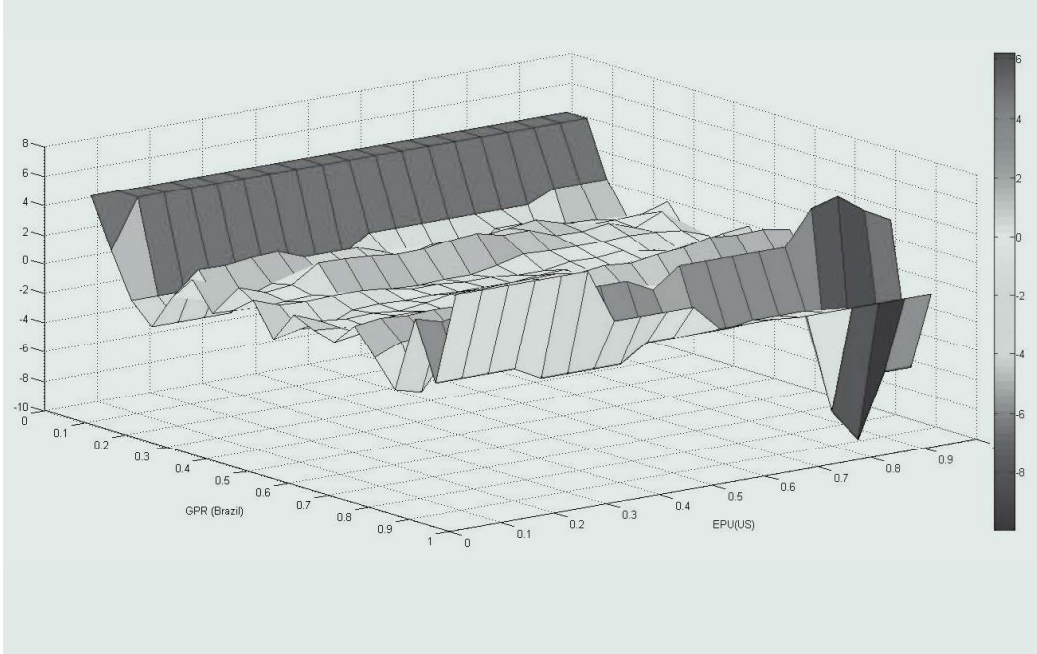




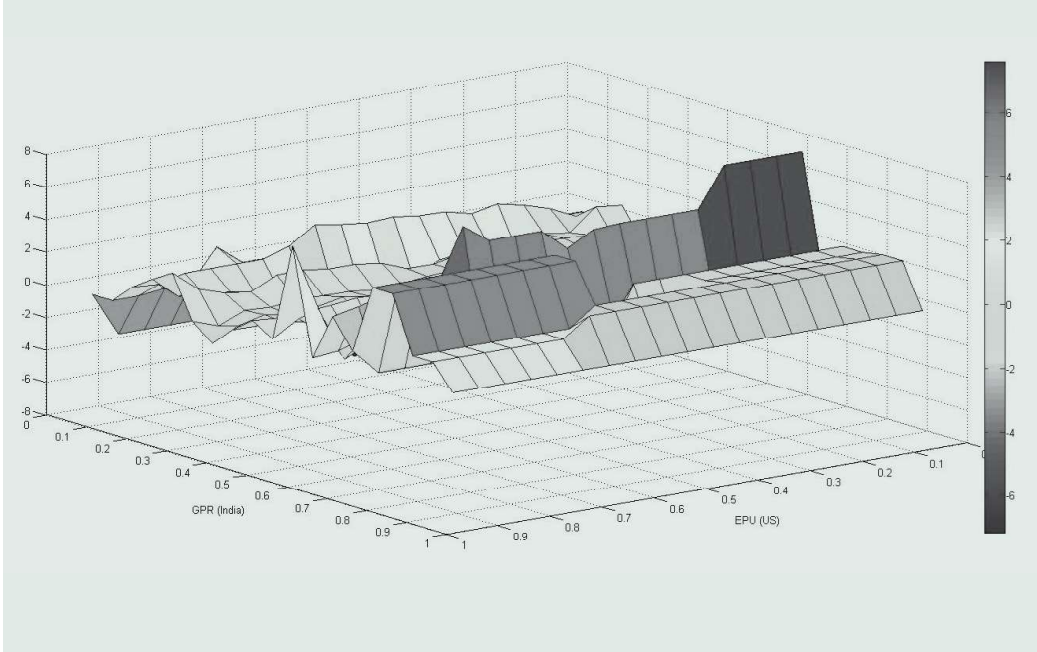
Figure 1

**ESTIMATES OF QUANTILE ON QUANTILE APPROACH**

**Panel (C): Brazil**



**Panel (D): India**



economic uncertainty, however, most of the past literature was devoted towards measuring the effect of own-country uncertainty on domestic stock returns using conventional mean based regression models. Given the fact that US economic policy uncertainty has strong contagious effects, we argue that it is important to check the relationship between US economic policy uncertainty and the geopolitical risk of BRIC economies because both US economic policy uncertainty and geopolitical risk are the drivers for volatility in the emerging economies stock markets. It is quite likely that both of these variables may be interlinked, and therefore, relationship between these measures should be checked. Moreover, since the risk and uncertainty measures have heavy tails, the conventional mean based regression models, which assume normal distribution of variables, will not suffice them and can lead to spurious results. The literature contains some exceptions in terms of using some non-parametric estimations such as causality in quantile approach or quantile vector auto regressive approach while examining the impact of domestic and global uncertainty on the domestic stock markets. However, none of these studies are found in past literature that attempted to check the relationship between US economic policy uncertainty and geopolitical risk.

The nexus between economic policy uncertainty and geopolitical risk may impact the asset prices in many ways. First and foremost, when an uncertainty strikes an economy due to any global financial shock, it delays the decision making process of the firms and investors. Secondly, it pushes up the production and financing costs by negatively affecting both demand and supply channels

and consequently intensifies disinvestments and economic contraction. Thirdly, it increases the risk associated with investment in financial market.

Following this notion, the given study estimates the response of the geopolitical risk of BRIC economies to the US economic policy uncertainty using a non-parametric estimation technique, i.e., Quantile on Quantile approach proposed by Sim and Zhou, (2015). Our findings suggested that out of four BRIC economies, China and Russia are largely insulated to the US economic policy uncertainty as most of the combinations of quantiles of US EPU and GPR of respective economies depicted negative correlation. For Brazilian and Indian economies, US policy uncertainty shocks were found to stimulate geopolitical risk in these economies as most of the combinations of quantiles of their GPR and US EPU showed a positive correlation.

The findings of our study have important implications for the investors and financial policy makers of firms and businesses. There are several factors that can cause heterogeneity in the reactions of emerging markets to the US economic uncertainty. These factors include the financial risks, instability in the domestic demand and also exposure to US dollars in their foreign exchange reserves. Moreover, these economies are also subject to the flow of 'Hot Money' in and out of their economic system which can be disrupting for them. Therefore, it is strongly recommended to these economies that they should increase the strength of their financial and economic systems. With a strong financial and economic system, these economies will be able to mitigate the US EPU transmission risk.

NOTES

- <sup>1</sup> The acronym BRIC (Brazil, Russia, India, China) was coined by Jim O' Neil, chief economist of Goldman Sachs in 2001.
- <sup>2</sup> BRICS: Brazil, Russia, India, China and South Africa (2010)
- <sup>3</sup> <http://www.policyuncertainty.com>.

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