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RESEARCH NOTE

The causal nexus between bank indices and geopolitical risk: bootstrap causality analysis under horizontal sector dependence

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Abstract
As the global economy thrives and pushes for sustainable growth, there are also a plethora of non-economic challenges arising from the respective dimensions of insecurity and geopolitical tensions such as inter- and intra-country conflicts. Geopolitical risk mostly arises from security tensions, war, and terrorist incidents, which hamper peaceful inter-country and regional cooperation, thus endangering state institutions such as financial institutions. Given this observation, the current study examines the relationship between the geopolitical risk index and bank indices by employing the bootstrap panel causality approach over a monthly period from September 2003 to December 2018. In this case, the causality analysis of the geopolitical risk index and bank indices for six (6) countries (China, Indonesia, Israel, Philippines, Saudi Arabia, and Turkey) was performed. Importantly, the investigation found causality only from the geopolitical risk index to bank indices in Turkey and Israel. Given the statistical evidence from the study, we offer related policy recommendations, especially for the examined countries.

Keywords Geopolitical risks · Bank indices · Bootstrap panel causality · Developing economies

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Introduction

The effects of geopolitical risk on assets in financial markets are essential information, especially for financial marketers in a location where geopolitical tensions are high (Bouri et al. 2018; Lee et al. 2021; Saint Akadiri et al. 2020). In this context, the geopolitical risk index (GPI), a monthly index based on newspaper records, was developed from instances of wars, terrorist acts, and tensions between countries by Caldara and Lacoviello (2018) as a metric for geopolitical risk. The GPI, which was first developed from the data collected from news reports on major monthly events over a certain period (1985–2019), contains components different from the political risk index published annually by the World Bank.

Considering the financial challenges that emanate from the incidences of geopolitical tensions, the current study draws its objective from the examination of causality between the geopolitical risk index and bank indices. With the bootstrap causality analysıs approach, this study examines the causality among the above-mentioned indices of a panel of six developing economies (China, Indonesia, Israel, Philippines, Saudi Arabia, and Turkey) during the period of September 2003 to December 2018. Apart from the issue of regional geopolitical tension associated with many of the developing countries, the consideration of these countries in particular stems from the following viewpoints: (i) previous global economic and financial crises have revealed the level of vulnerability in the banking and financial sectors of emerging market economies (EMEs) and (ii) EMEs account for more than half of the world's gross domestic product and gross capital flows (European Central Bank, 2018). Among the leading developing countries, data availability is limited to the countries being considered in this study. Until now, the relationship between the geopolitical risk index and bank indices has been rarely examined in the extant literature. Thus, this investigation is considered an important addition to this body of knowledge.

Literature review

On a theoretical level, Tobin (1969) pioneered an intuitive perception guiding the framework of the disruptive effects of external shock, especially based on an equilibrium condition. This perception has also been discussed by several other studies (Apergis et al. 2017; Iltaş et al. 2017; Nishiyama et al. 2011). Following this notion, Iltaş et al. (2017) tested the relationship between the shares traded on BIST and geopolitical risks by using the generalized method of moments (GMM) method. The data range for the study covered the years between 1988 and 2014. From the result of the study, a negative relationship was found between geopolitical risks and stock returns. Additionally, Akdağ et al. (2018) tested the relationship between the geopolitical risk index and the leading stock market indices of twelve countries using panel cointegration and panel causality analyses. The result of the study showed causality from the change in the geopolitical risk index to the return of stock market indices. The findings further determined that an increase in geopolitical risks has a significant and negative effect on stock market index returns.

Furthermore, Pan (2018) examined the relationship between the geopolitical risk index and stock and real estate returns by employing a panel regression analysis. By using datasets from 17 countries between 1899 and 2016, the study revealed that an increase in geopolitical risks decreased stock returns and real estate returns. Meanwhile, Aysan et al. (2019) tested the relationship between the geopolitical risk index and Bitcoin returns by employing the ordinary least squares (OLS) prediction method. By using daily data between July 18, 2010, and May 31, 2018, Aysan et al. (2019) revealed a negative relationship between the geopolitical risk index and Bitcoin returns. However, the result further revealed that high volatility exerts a positive effect on Bitcoin returns. In Demir et al. (2019), the relationship between the geopolitical risk index and the number of tourists visiting countries was also tested with the GMM method. By using the annual data of 18 countries between 1995 and 2016, the analyzed result revealed that geopolitical risks negatively affected the number of tourists.

Moreover, Bouras et al. (2019) offered more explanations as to the relationship between the geopolitical risk index and the returns and volatility of stock market indices by employing the generalized autoregressive conditional heteroskedasticity (GARCH) approach. As a result of the analysis, which used the monthly data of 18 developing countries between November 1998 and June 2017, the investigation revealed that geopolitical risks do not have a significant effect on stock market returns but have an effect on the volatility of stock markets. A similar study by Bouri et al. (2019) employed the data of the geopolitical risk index and the Dow Jones Islamic World Stock Index between January 1996 and March 2017. Specifically, the study examined the relationship between the geopolitical risk index and the Dow JonesSukuk Index for the period between October 2005 and March 2017 by using the nonparametric Granger causality test approach. Interestingly, the study found that the geopolitical risk index affects the volatility of the index rather than the returns of the Dow Jones Islamic World Index. Generally, the result demonstrates that the geopolitical risk index is successful in predicting both the returns and volatility of the Dow JonesSukuk Index.

Data and methodology

Data

Monthly data between September 2003 and December 2018 of the six selected countries for the geopolitical risk index and bank or finance indices were used in the study. Bank indices data for the countries were obtained from the Borsa Istanbul, Bloomberg, and investing.com websites. Geopolitical risk index data were taken from online sources likewww.policyuncertainty.com. The countries and their bank indices included in the analysis are given in Table 1. The selection of the examined countries (China, Indonesia, Philippines, Israel, Saudi Arabia,

Table 1 Bank Indices of the Examined Countries

Countries	Bank Indices
China	FTSE ChinaBanks
Indonesia	IDX Finance
Philippines	PSFI
Israel	TELBANK5
Saudi Arabia	TBNI
Turkey	BIST Bank Index

and Turkey) among several **other** developing countries is also a subject of data availability since the bank and geopolitical **indices were** restricted to the six **aforementioned** countries.

Methodology

In the study, cross-sectional dependency and homogeneity tests were performed for the variables before the causality analyses were carried out. The results of the relevant tests are important for choosing the unit root and causality tests to be used in the analysis. To see whether there was dependency between cross sections (countries) vis-a-vis cross-sectional dependency, the LM (Lagrange multiplier) test developed in Breusch and Pagan (1980), the CDLM and CD tests developed in Pesaran (2004), and LMadj test developed by Pesaran et al. (2008) were also performed. The CD and CDLM tests are preferred when the cross-sectional size is larger than the time dimension, while the Lagrange multiplier (LM) and LMadj tests are preferred when the time dimension is greater than the cross-sectional dimension (Kar et al. 2011; Menyah et al. 2014). Furthermore, using the slope homogeneity test developed by Pesaran and Yamagata (2008), it was tested whether the coefficients of the explanatory variable changed from one cross section to another.

In order to determine whether the data were stationary and the appropriate test tool to implement, as informed by the above-mentioned cross-sectional dependency and homogeneity test results, the test developed in Im et al. (2003), as a first generation unit root test, and Pesaran (2007), which is a more recently developed unit root test, were both implemented. The Im et al.'s (2003) unit root test was preferred in the assumption of a heterogeneous model, while the CADF test developed in Pesaran (2007) was preferred in the assumption of a cross-sectional dependency. Moreover, a CADF test can be used in both N > T and T > N states (Pesaran 2007, p. 269).

Panel granger causality

The bootstrap panel causality test developed by Kónya (2006) was used in the study. The relevant test is based on the seemingly unrelated regression system (SUR) and Wald tests with country-specific bootstrap critical values. The bootstrap panel causality test is not based on the assumption that the panel is homogeneous. Therefore, Granger enables the testing for causality for each cross section. Additionally, since the empirical approach enables simultaneous relationships between horizontal sections, it has the potential to offer additional information concerning the panel data (Özcan 2015). The relevant test also calculates the Wald test estimates separately for each country. Again, the pretests such as the unit root and cointegration tests are not really pretest requirements. However, the level values of the data used in the analysis are taken into account (Kar et al. 2011; Menyah et al. 2014).

In this test, Eqs. (1 and 2) showing a causality relationship and based on a bivariate VAR model can be presented as follows (Emirmahmutoğlu and Köse 2011):

$$x_{i,t} = \mu_i^x + \sum_{j=1}^{k_i + d\max_i} A_{11,ij} x_{i,t-j} + \sum_{j=1}^{k_i + d\max_i} A_{12,ij} y_{i,t-j} + \mu_{i,t}^x \tag{1}$$

$$y_{i,t} = \mu_i^y + \sum_{j=1}^{k_i + d\max_i} A_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i + d\max_i} A_{22,ij} y_{i,t-j} + \mu_{i,t}^y \tag{2}$$

(2)

Table 2 Descriptive statistics

Variables	Mean	Minimum	Maximum	Standard Error
lnGeopoliticrisk	4.536	3.078	5.457	0.3264
lnBankIndex	8.355	4.255	12.154	1.983

Table 3 Horizontal section dependency and homogeneity test results

Test	Statistic	Probability
LM	464.083*	0.000
CD_{LM}	81.991*	0.000
CD	-3.396*	0.000
LM_{adj}.	97.650*	0.000
$\check{\Delta}$	111.834*	0.000
$\check{\Delta}_{adj}$	113.063*	0.000

*Significant at a 1% significance level

i = 1, 2,…, N ve j = 1, 2,…, k

The x_i and y_i variables represent the error term μ_i, a fixed-effects matrix, while k_i is the lag and $d\,max_i$ is the maximum integration value for each cross section (i) at t time period.

Findings

The descriptive statistics of the employed geopolitical risk index and the bank indices data are provided in Table 2. With the descriptive statistics in Table 2, it is clear that the volatility of the bank indices is higher than the volatility of the geopolitical risk index. Before performing the causality analysis, the data were subjected to cross-sectional dependency and homogeneity tests. The results are given in Table 3. Thus, the adopted analysis considers the heterogeneity of the slope coefficients and the cross-sectional dependency.

According to the results of the cross-sectional dependence test in Table 3, the null hypothesis (i.e., there is no cross-sectional dependency) was rejected at the 1% significance level. This implies that there is a level of interdependency between certain changes across the countries. As also indicated in Table 3, the test result shows whether the coefficient is homogeneous or not. Accordingly, the hypothesis that the slope coefficient is homogeneous at a 1% significance level was rejected. This result paved the way for the adoption of the appropriate unit root test with the results displayed in Table 4. Moreover, the unit root test results in Table 4 indicate that the geopolitical risk index is stable both in the level and in the difference series, while the bank indices series contains unit roots in the level series and is stable in the difference series. The above results paved the way for the use of the bootstrap panel causality examination in order to determine the nature of the Granger causality relationship between variables. The results are given in Table 5.

The result of the investigation in Table 5 shows that the null hypothesis is rejected, meaning that the causality result of the alternative hypothesis is valid. This demonstrates that there is causality from the geopolitical risk index to bank indices only for Turkey and Israel. The reason for the expected result can be linked to the fact that the two countries (Israel and Turkey) are located in the Middle East region. This region is

Table 4 Unit root test results

Variables	Im, Pesaran, and Shin		Pesaran (2007) CADF	
	Constant	Constant and trend	Constant	Constant and trend
lnGeopoliticrisk	−8.529*	−12.286*	−1.977**	−3.260*
ΔlnGeopoliticrisk	−32.137*	−33.491*	−6.190*	−6.420*
lnBankIndex	−1.296***	−1.275***	0.210	0.357
ΔlnBankIndex	−30.403*	−31.856*	−5.185*	−5.217*

*Significant at *1%, **5% and ***10%

Table 5 Bootstrap panel causality test results

H_0: Geopolitical risk is not the cause of stock market indices			
Countries	Lag	Wald test	Probability
China	2	2.515	0.284
Indonesia	2	3.745	0.154
Philippines	2	2.190	0.335
Israel	2	5.035**	0.081
Saudi Arabia	2	1.677	0.432
Turkey	3	11.983*	0.007

*1% is significant at the **10% significance level

potentially prone to regional tension arising from internal conflict and unrest (such as the Arab spring) and is thus responsible for the causal link between the examined indices in Turkey and Israel.

Investors in these countries are likely to be weary of the region's vulnerability and geopolitical risks, among other factors, when investing in the stocks of banks. For the causality between the geographical risk index and bank indices of the other four countries, the results fail to establish statistical evidence of causality. Generally, the results of the analysis are similar to those found in Akdağ et al. (2018), Bouri et al. (2019), İltaş et al. (2017), and Pan (2018) as well as the evidence of a geopolitical risk–tourism nexus in Lee et al. (2021) and Saint Akadiri et al. (2020).

Conclusion and policy implication

This study tests whether there is a causal relationship between the geopolitical risk index and bank indices. In this context, the geopolitical risk index and bank indices of six (6) selected emerging economies countries (China, Indonesia, the Philippines, Israel, Saudi Arabia, and Turkey) were examined by employing a monthly dataset between February 2003 and December 2018. The study reveals that there is Granger causality between the geopolitical risk index and bank indices for only Israel and Turkey. The geographical location of the two countries could be attributed to the above-mentioned statistical evidence, given the incessant unrest in the Middle East region and the constant tension between Israel and Palestine.

Policy implication

The results of the study give rise to certain policy recommendations for potential investors in Turkey and Israel. In particular, the listed shares of the banking sectors are evidently prone to geopolitical risks, thus affecting the confidence of potential investors. Considering the increased geopolitical risks in the region or in any conflict-prone country, a policy of portfolio diversification can be further encouraged by using international investment instruments for risk protection. This approach by the financial authorities should be directed at reducing the impact of geopolitical risks, thus preventing volatility in the stock markets, which is a leading indicator of the position of the banking market. To improve on the limitations of the study, applying the effects of geopolitical risks to other economic and financial indicators of the countries and using more sophisticated methods should be the focus of a future study.

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Declarations

Conflict of interest Theauthor wishes to disclose here that there are no potential conflicts ofinterest at any level of this study.

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