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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

RETURN SPILLOVERS BETWEEN EMERGING MARKETS' FINANCIAL STRESS AND EQUITY MARKETS OF BRIC-T COUNTRIES

GELİŞMEKTE OLAN PİYASALARIN FİNANSAL STRESİ VE BRIC-T ÜLKELERİNİN HİSSE SENEDİ PİYASALARI ARASINDAKİ GETİRİ YAYILIMI

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Abstract

This study explores the connectedness between selected emerging equity markets (BRIC-T) and the Emerging Markets Financial Stress Index (EMFSI). We aim to reveal the extent of spillovers from stock market indices to aggregated financial tension in these countries. Empirical investigations are executed through Quantile Vector Autoregression analysis. Results show that spillovers occur mainly during extreme negative and positive return periods. When we focus on four important phases, namely Global Financial Crisis (GFC), the Euro Area Sovereign Debt Crisis, the COVID-19 pandemic, and the Russia-Ukraine war, three countries come to the fore. While Brazil has had a substantial and persistent impact across the years, during the GFC, two other countries, Russia and Türkiye, seem to induce positive return spillovers toward emerging markets' stress. This impact becomes bilateral in Russia (both in positive and negative returns) during the pandemic and the Russia-Ukraine war. Thus, we conclude that among the examined market economies, negative or positive return transmissions to emerging market stress are led mainly by Brazil and Russia. The importance of energy sources and political factors can account for this result.

Keywords: Emerging markets, Financial stress index, Quantile Vector Autoregression, Return spillover
Jel Classification: C10, C32, C58, G15

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Öz

Bu çalışmada, seçili gelişmekte olan hisse senedi piyasaları (BRIC-T) ile gelişmekte olan piyasaların finansal stres endeksi (EMFSI) arasındaki ilişki incelenmiştir. Çalışma ile amaçlanan, bu ülkelerdeki hisse senedi endekslerinden birleşik finansal stres endeksine doğru olan yayılımın büyüklüğünü ortaya çıkarmaktır. Analizler Kuantil Vektor Otoregresyon yöntemi üzerinden gerçekleştirilmiştir. Bulgular, yayılımın özellikle ekstrem negatif ve ekstrem pozitif getiri dönemlerinde gerçekleştiğini göstermiştir. Küresel Finansal Kriz, Avrupa Borç Krizi, COVID-19 pandemisi ve Rusya-Ukrayna savaşı gibi dört önemli dönem dikkate alındığında, özellikle üç ülkenin öne çıktığı gözlemlenmiştir. Bu ülkelerden Brezilya'da oldukça önemli ve süreklilik gösteren etkiler söz konusu iken, Rusya ve Türkiye'nin ise Küresel Finansal Kriz sırasında gelişmekte olan piyasaların finansal stres endeksine doğru pozitif getiri yayılımına neden olduğu gözlemlenmiştir. COVID-19 pandemisi ve Rusya-Ukrayna savaşı döneminde bu etki Rusya'da hem pozitif hem de negatif olmak üzere iki yönlü olarak ortaya çıkmıştır. Böylelikle, analiz kapsamında incelenen ülkelerden özellikle Brezilya ve Rusya'nın gelişmekte olan piyasaların finansal stresine negatif ya da pozitif getiri transferini sağlayan ülkeler olduğu görülmüştür. Enerji kaynaklarının ve politik faktörlerin bu bulguda önemli bir rol üstlendiği düşünülmektedir.

Anahtar Kelimeler: Gelişmekte olan piyasalar, Finansal stres endeksi, Kuantil Vektör Otoregresyon, Getiri yayılımı

JEL Sınıflandırması: C10, C32, C58, G15

1. Introduction

The emergence of various crises and associated shocks have potential dramatic effects on the financial markets. These crises and shocks generally result in periods of financial stress, which are characterized by the unregular functioning of markets and financial instability. Therefore, the ability to monitor and quantify financial instability has become a crucial issue on both academic and practical grounds.

Even though no precise uniform definition has been put forth for financial stress, which is an unobserved variable in the economy, almost all definitions agree that stress is associated with the disturbance in the regular functioning of the financial markets. According to Grimaldi (2010, p.8), stress occurs due to an interaction between vulnerable markets and shocks. As the severity and fragility of the financial conditions increase such that markets become more vulnerable, the probability that a shock turns into financial stress increases. In a prior study, Illing and Liu (2006) state that the level of stress exerted on a system depends on the size of the shocks, the existing conditions in the system, and the way financial system is structured. Furthermore, they emphasize that stress increases with a rise in expected financial loss, risk, and uncertainty. Moreover, Abdymomunov (2013, p. 456) defines financial stress as '*a condition of financial markets where market participants experience increased uncertainty or change their expectations about future financial losses, fundamental value of assets, and economic activity*'.

Despite the different definitions of financial stress in the related literature, five circumstances have been linked with stress as stated by Hakkio and Keeton (2009). These critical circumstances are increased uncertainty about the fundamental value of assets, increased uncertainty about the behavior of other investors, increased asymmetry of information, decreased willingness to hold risky assets,

and decreased willingness to hold illiquid assets. Depending on the stage of the financial stress, at least one of these circumstances is involved, though; mostly all of them are seen to be involved.

In order to quantify financial stress, different indices have been developed. One of them is the Financial Stress Index (FSI) measure developed by Office of Financial Research (OFR), which is defined as disruptions in the normal functioning of the financial markets. The construction of this index is made up of two steps; namely indicator selection and aggregation. In order to achieve a broad coverage, the indicators comprise five major categories, namely; credit, equity valuation, funding, safe assets, and volatility together with associated variables that move through time and encompass three regions. These regions are U.S.-centric, other advanced economies, and emerging markets. The primary characteristics that distinguish OFR FSI measure from other financial stress indices can be stated as its having a global scope, being daily based, having a dynamic scheme, and being easily decomposed into regions and indicator categories (Monin, 2019). In line with the scope of the study, Emerging Markets Financial Stress Index (EMFSI), which is a sub-category of FSI, is utilized as a proxy for financial stress.

As a vital component of global economic activity but relatively unstable markets, emerging countries draw attention to their financial stress and its interactions during various economic conditions. In this regard, BRIC countries have great importance to explore. The BRIC (Brazil, Russia, India, China) acronym, which is originally suggested in 2001 by Jim O'Neill, an economist at Goldman Sachs, stands for the countries namely Brazil, Russia, India, and China. These countries are significant developing economies and are expected to have leading roles in the world economy. Even though these four countries started to meet initially as a group in 2006, South Africa joined these countries only in 2010, making these group of five countries to be referred to as BRICS in February 2011 (Gusarova, 2019; Morazan et al. 2012). The high growth potential and magnitude of their economies, together with their demographic scales, make these countries attract attention from global media and academic literature. A common feature of these countries is that they are fast-developing nations and generally represent the largest economies with respect to their regions. According to World Development Indicators, BRICS countries make up 41% of world population, 25.6% of world GDP, and 18.1% of world trade as of 2021 (The World Bank, World Development Indicators). Based on a report published by Goldman Sachs (2003), the economies of the BRIC countries are expected to become an influential driving force of the world economy in terms of GDP growth, income per capita, and currency movements. Furthermore, their GDP volume is forecasted to surpass that of the major advanced countries by 2050.

The purpose of this study is to evaluate the relationship between the equity markets of BRIC countries and financial stress, which is quantified by the Emerging Markets Financial Stress Index (EMFSI) for the period between January 4, 2000, and January 23, 2023. This study excludes South Africa from the sample due to data availability issues. Besides the BRIC countries, we also present evidence from Türkiye as it displays the characteristics of an emerging force in the region. Accordingly, the study incorporates Türkiye in the dataset as well. Therefore, BRIC-T countries will be evaluated in the empirical analysis with a specific focus on the indices, namely; BVSP of Brazil, MOEX of Russia, SNX

of India, SHC of China, and XU100 of Türkiye. Keeping the time interval long enables the evaluation for significant events, namely; the Global Financial Crisis of 2008-2009, the Euro Area Sovereign Debt Crisis of 2010-2012, the COVID-19 pandemic of 2020-2021, and the Russia-Ukraine War of 2022. Accordingly, the contribution of the current study is to reveal evidence regarding the impact of financial stress on stock market returns of the above stated emerging countries. The lack of sufficient evidence for these countries makes the contribution of this study vital for the related array of literature. By providing evidence from extreme market conditions through Quantile Vector Autoregression (QVAR) analysis, we aim to assist investors and policymakers regarding the transmission of returns from equity markets to their aggregated financial stress. The direction detected in the propagation of returns might be related to the dissemination of market information among these countries. Thus, future market events may alarm investors and policymakers to track the potential network in spreading returns and take corresponding measures. Additionally, our results may suggest beneficial information in identifying the characteristics of equity markets that induce increasing or decreasing impacts on market stress.

This paper proceeds as follows; the next section is dedicated to literature review. The third section displays the empirical analysis including the dataset, variables utilized, and the methodology. In the fourth section, the findings of the analysis are revealed; lastly followed by concluding remarks.

2. Literature Review

Events like wars, unexpected health crises, natural disasters, and financial crises generally result in financial shocks that lead to stress in financial markets. Empirical evidence indicates that the dynamics of stock price movements are affected during these stressful periods. Following the emergence and the destructive consequences of the global financial crisis of 2007-2009, interest in literature on the influence of financial shocks on stock markets has increased. Furthermore, significant events like the Euro Area Sovereign Debt Crisis of 2010-2012, the oil crises, the Arab spring, the COVID-19 pandemic, Russia-Ukraine War of 2022 added to this interest. Despite the growing interest in evaluating the influence of financial shocks on stock markets through FSIs, the impact of financial stress on stock market returns in the BRIC-T countries has not been fully investigated as far as our literature review is concerned. This section will continue with a review of limited number of studies that investigate the potential relationship between financial stress indices and stock market returns.

A cross-country study performed by Christopoulos et al. (2011) analyzes the potential impact of the financial crisis quantified by the financial stress index on major stock markets of England, France, Japan, the United States, and Greece. The index utilized is developed for each country based on data belonging to the banking systems, securities markets, and the foreign exchange markets of each individual country. Results of the study, which covers the period between July, 2005 and December, 2008, reveal that all selected markets are negatively influenced by the financial crisis with the Tokyo stock exchange being mostly affected.

Sum (2013) examines how financial stress affects the risk premiums in the stock markets together with the causality of the relationship for monthly data covering the period between January, 1994 and May, 2012. The findings of the study for the link between the Federal Reserve Bank of St. Louis Financial Stress Index and excess returns on the Center for Research in Security Prices (CRSP) value-weighted index demonstrate that financial stress negatively affects market risk premiums in the first, second, third, fourth, and twelfth months. As to the direction of the relationship, financial stress is found to granger-cause market risk premiums with no reverse causality. In another study, Sum (2014) probes the dynamic effect of financial stress on Real Estate Investment Trust (REIT) returns in the US utilizing Federal Reserve Bank of St. Louis Financial Stress Index for the period between the years 1994 and 2011. Based on the results of the Granger-causality test, the returns of the selected REIT indices and subindices are found to drop due to financial stress. Furthermore, the findings show that selected indices turn negative in the first few months following the peak in the selected financial stress indicator. Another study for the US market that investigates the association between risk and stock market returns is that of Berger and Pukthuanthong (2016). The risk measure utilized combines fragility, which measures the market's susceptibility to a shock, and market stress, which captures the probability of the occurrence of the shocks. The empirical evidence reveals that the selected proxy for risk is a predictor of poor monthly market returns.

Mezghani and Boujelbéne-Abbes (ahead-of-print) analyze the interrelationships between financial stress, oil, and stock-bond markets of Cooperation Council (GCC) countries for the timespan between 2007 and 2018, which includes the recent global financial crisis and 2014 oil crises. Seven indicators for each country in the group including stock market returns, stock volatility, exchange market pressure index, beta of the banking sector, sovereign spreads, inverted term spreads, and TED spreads are used to build the FSI as the stress indicator. Heterogeneous results are revealed in the case of evaluating the influence of oil shocks and financial crashes on the correlation between stock and bond markets. During the oil crisis in 2014, bond markets are not found to be affected by oil price fluctuations. However, contagion is detected to come from oil and stock markets in the recent global financial crisis period. Finally, FSI is found to have a dominant role in negatively influencing the selected stock markets.

A comprehensive study performed for selected eleven countries in the MENA region examines the impact of financial stress on stock market performance. The analysis period covers the years between 2007 and 2018 and includes significant events like the 2008-2009 global financial crisis, 2012-2015 oil crises, and the Arab Spring. The evidence shows that stock index performance is dependent positively on its past, which is also observed for the stress index though with delays by either one or two periods. Furthermore, the findings indicate that any positive shock on the stress index has a negative effect on market performance for the first year; whereas, this fades away slowly in the long-run (Soltani et al. 2021).

A single-country study by Rezagholizadeh et al. (ahead-of-print) investigating the impact of financial stress index on industrial stock returns of Tehran Stock Exchange utilizes panel data method for a daily dataset between 2005 and 2020. The FSI indicator used in the analysis is a combined index

made up of financial stress in capital, currency, and money markets. Additionally, individual stress in each of these markets is also studied in a total of four different models. The findings of the analyses demonstrate a negative and significant impact of financial stress on industrial stock returns in all models.

A recent study by Xu et al. (2023) evaluates the influence of Chinese financial stress index on stock market returns for a sample period of January, 2008 and March, 2020. This index comprises factors that encompass financial conditions of China in the banking, foreign exchange, equities, and bond markets. The results show financial stress to be negatively and significantly linked to the stock returns of the following month. Additionally, this predictive power is found to be stronger during bull markets relative to bear markets.

Analyzing the influence of selected stock markets on the financial stress index of India for the period between October, 2003 and October, 2014; Singh and Singh (2016) evaluate the issue from a different perspective in comparison to the above mentioned studies. The financial stress index utilized encompasses the equity, debt, foreign exchange, and money markets of India; whereas, the selected stock markets can be listed as those of the US, Europe, frontier, and BRIC stock markets. The study's major findings show the Indian FSI to be influenced by the BRIC stock market returns. The relationship is negative in nature in the short-run; hence, positive BRIC returns are found to reduce the stress index that further emphasizes the integrated nature of the markets. Furthermore, the European markets are found to cause short-run volatility on the Indian financial system.

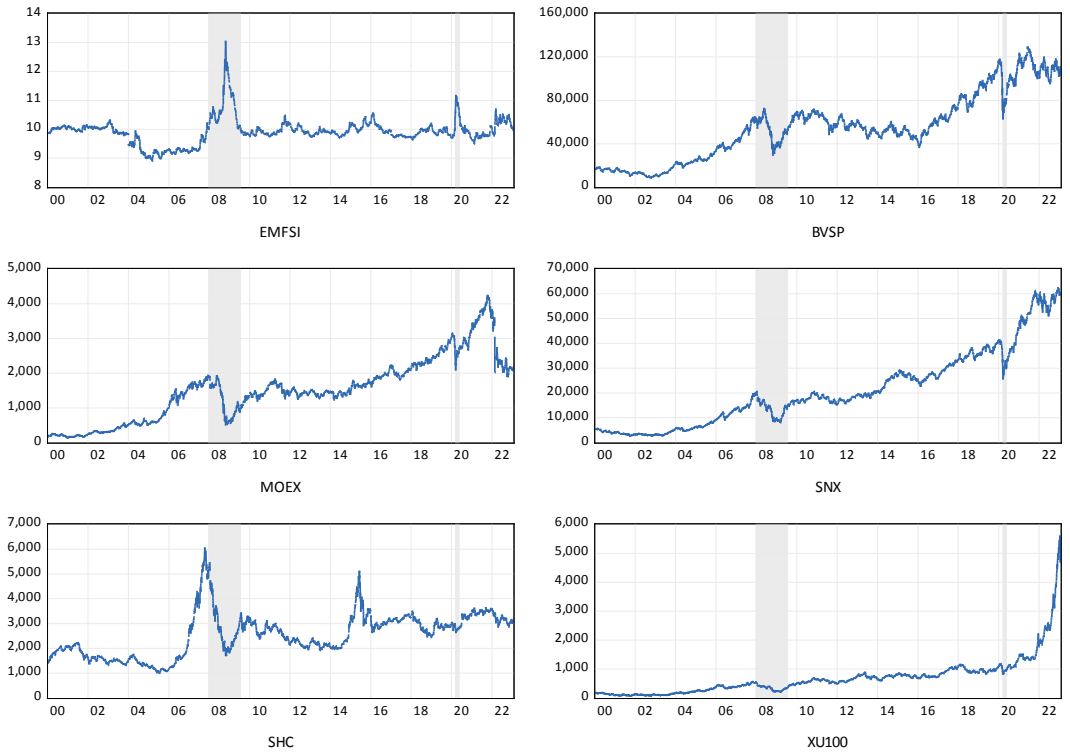
As the related literature review reveals, studies investigating the connectedness between financial stress and stock returns, though limited in number, indicate that financial stress negatively affects stock returns in general.

3. Empirical Analysis

Emerging economies are mostly identified with young populations, rapid and aggressive growth strategies, less transparency, and high volatility in financial markets. Difficulties in access to international capital markets and budget constraints are significant challenges for these countries to deal with. On the other hand, their distinctive features may offer some advantages at particular times. For instance, the absence of sophisticated credit derivative instruments and the corresponding markets was an advantage for them during the Global Financial Crisis of 2008. As discussed in European Central Bank (ECB) report (2010), China was quite resilient against this crisis and its GDP declined only by 0.5% in 2009. However, during the COVID-19 pandemic, many countries could not remain strong, especially tourism-dependent economies and oil exporters have suffered severely due to measures such as lockdowns, social distancing, and the decline in energy consumption. The existence of common obstacles to overcome and needs to meet induced similar issues especially in emerging countries' economic and social policies. Thus, their distinctive features made them subject to common hazards and opportunities in financial markets to a certain extent because each country's idiosyncratic features may differentiate them from others. To be able to test and quantify this insight,

in this study, we explore the interactions between BRIC-T (Brazil, Russia, India, China and Türkiye) countries' equity markets and the Emerging Markets Financial Stress Index (EMFSI) introduced by the Office of Financial Research through the return spillovers. The selected equity market indices of BRIC-T countries are as follows: BVSP (Brazil), MOEX (Russia), SNX (India), SHC (China), XU100 (Türkiye). EMFSI is one of the sub-indices of the Financial Stress Index (FSI). Monin (2019) shows that the index is quite robust in capturing market developments. The dynamic weighting model and its high frequency differ the index from its alternatives. The FSI can be decomposed into various components, such as regions and categories. In this study, as per our objectives, we extract the EMFSI from the aggregated values of FSI.

Figure 1: Price Series of the Variables



Empirical analyses are conducted through the Quantile VAR model of Ando et al. (2018) and Chatziantoniou et al. (2021). As this model enables us to sort the returns in predefined quantiles, we can examine each interaction under various market conditions, namely; bear market, tranquil conditions, and bull market trends. This categorization corresponds to extremely low, median, and extremely high returns. The empirical investigation is carried out through R for 4.01.2000 and 23.01.2023. By keeping the time interval considerably long, we aim to present evidence for important events in this period, such as the Global Financial Crisis of 2008-2009, the Euro Area Sovereign Debt Crisis of 2010-2012, the COVID-19 pandemic (2020-2021) and the Russia-Ukraine War of

2022. Figure 1 populates the price series of the variables. Shaded areas demonstrate the National Bureau of Economic Research (NBER) recession periods during GFC and the COVID-19 pandemic. It is apparent that markets rebounded significantly faster after the pandemic than GFC. Each equity market experiences a plunge during the GFC to varying extents. While BVSP, MOEX, and SHC display a very sharp drop, the decline occurs more smoothly in SNX. On the other hand, XU100 possesses substantially less fall in this period than other countries. The length of the recession during the pandemic is relatively short and each market illustrates a steeper plummet than that of the GFC. Even in this case, the Turkish stock market's reaction becomes relatively less strict.

Descriptive statistics of the variables are presented in Table 1, below. Results indicate that all variables have an average return around zero. According to the standard deviation statistics, the highest fluctuations occur in the returns of EMFSI. The value found (0.2759) is considerably higher than the corresponding statistics of other variables. As shown by skewness and kurtosis statistics, all return variables exhibit departures from normality, possess asymmetries, and fat tails in their probability distributions. Accordingly, while EMFSI is positively skewed, all other variables are negatively skewed by indicating a higher frequency of above-mean returns than below-mean returns. The significant Jerque-Bera test statistics also confirm the presence of non-Gaussian distribution at the 1% level. Finally, we employed the unit root test of Stock et al. (1996) to test if the series is stationary. The test is quite robust even when the mean and trend of the variables are unknown and the sample size is small. As the results indicate, all values attained are statistically significant at the 1% level, which necessitates the rejection of the null hypothesis of the variable is integrated of order one.

Table 1: Descriptive Statistics

	EMFSI	BVSP	MOEX	SNX	SHC	XU100
Mean	0.0002	0.0003	0.0004	0.0004	0.00015	0.0006
Std. Dev.	0.2759	0.0175	0.0203	0.0144	0.020299	0.0203
Skewness	0.0902	-0.3868	-1.5411	-0.7257	-0.41053	-0.3555
Kurtosis	29.3024	9.9377	44.7916	16.4153	9.391303	12.4637
Jarque-Bera	167427*	11792.62*	424960*	44062.79*	10048.54	21796.39*
ERS	-28.042*	-9.675*	-34.597*	-7.887*	-31.721*	-8.143*

* denotes significance at the 1% level.

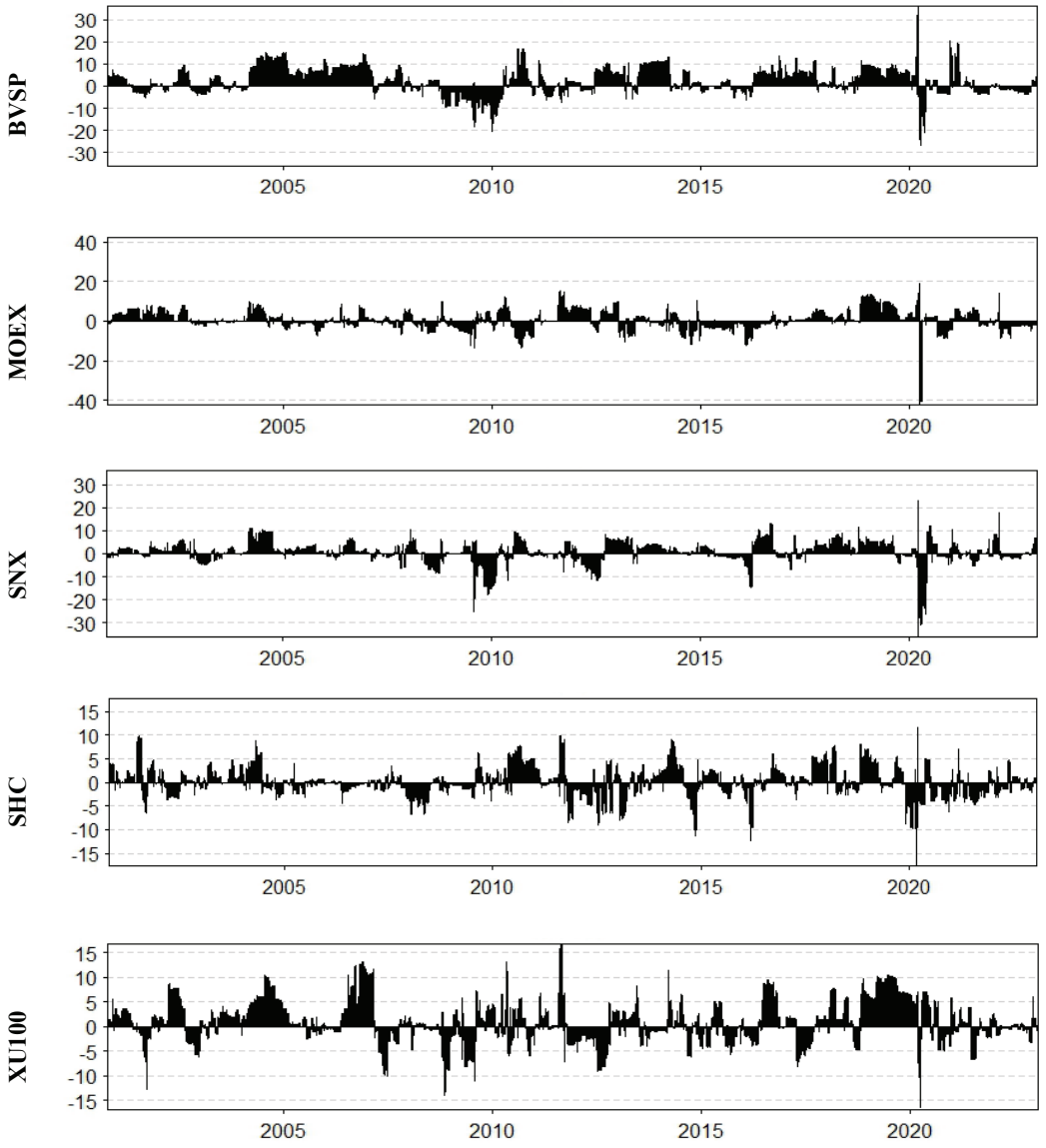
To reveal the pattern of return spillovers between EMFSI and each country's equity markets, at this stage, we employ the QVAR model and present the results in three quantiles: 0.05, 0.50 and 0.95 as can be seen in Table 2. In the execution of the analysis, we form pairs with EMFSI and the five equity market indices. In the configuration of the models, we use 200 days of window size and 20 days of the forecast horizon. Table 2 contains both total directional connectedness FROM-others and TO-others. The NET, on the bottom of each group, presents the result of total directional spillovers TO minus FROM; thus, it can be interpreted as spillovers transmitted to others minus those received from others. Therefore, this row's positive (negative) values demonstrate that the variable is a net transmitter (receiver) of spillovers.

Table 2: Connectedness Analysis Results in Various Quantiles

	Extreme Lower Quantile ($\tau = 0.05$)			Median Quantile ($\tau = 0.50$)			Extreme Upper Quantile ($\tau = 0.95$)		
	EMFSI	**BVSP**	**FROM**	**EMFSI**	**BVSP**	**FROM**	**EMFSI**	**BVSP**	**FROM**
EMFSI	68.15	31.85	31.85	84.20	15.80	15.8	69.08	30.92	30.92
BVSP	28.57	71.43	28.57	12.81	87.19	12.81	28.62	71.38	28.62
TO	28.57	31.85	60.42	12.81	15.80	28.61	28.62	30.92	59.54
NET	-3.27	3.27		-2.98	2.98		-2.29	2.29	
	EMFSI	**MOEX**	**FROM**	**EMFSI**	**MOEX**	**FROM**	**EMFSI**	**MOEX**	**FROM**
EMFSI	71.3	28.7	28.70	87.4	12.60	12.60	70.70	29.30	29.30
MOEX	28.59	71.41	28.59	12.12	87.88	12.12	28.85	71.15	28.85
TO	28.59	28.70	57.29	12.12	12.60	24.72	28.85	29.30	58.15
NET	-0.10	0.10		-0.49	0.49		-0.45	0.45	
	EMFSI	**SNX**	**FROM**	**EMFSI**	**SNX**	**FROM**	**EMFSI**	**SNX**	**FROM**
EMFSI	71.94	28.06	28.06	88.45	11.55	11.55	70.1	29.90	29.90
SNX	28.45	71.55	28.45	11.83	88.17	11.83	29.28	70.72	29.28
TO	28.45	28.06	56.51	11.83	11.55	23.37	29.28	29.90	59.18
NET	0.38	-0.38		0.28	-0.28		-0.62	0.62	
	EMFSI	**SHC**	**FROM**	**EMFSI**	**SHC**	**FROM**	**EMFSI**	**SHC**	**FROM**
EMFSI	69.48	30.52	30.52	94.51	5.49	5.49	69.29	30.71	30.71
SHC	30.71	69.29	30.71	5.65	94.35	5.65	30.67	69.33	30.67
TO	30.71	30.52	61.23	5.65	5.49	11.14	30.67	30.71	61.38
NET	0.19	-0.19		0.16	-0.16		-0.04	0.04	
	EMFSI	**B100**	**FROM**	**EMFSI**	**B100**	**FROM**	**EMFSI**	**B100**	**FROM**
EMFSI	72.25	27.75	27.75	88.61	11.39	11.39	70.56	29.44	29.44
B100	28.54	71.46	28.54	11.27	88.73	11.27	28.50	71.50	28.50
TO	28.54	27.75	56.29	11.27	11.39	22.66	28.50	29.44	57.94
NET	0.80	-0.80		-0.13	0.13		-0.94	0.94	

According to the results of QVAR analysis, out of five stock markets, BVSP and MOEX are net transmitters of returns to the EMFSI index under each quantile. Other countries display mixed results. On the other hand, the pattern is clear that as quantiles increase, each country tends to be a net transmitter. When we consider the overall results under each quantile, it is apparent that Brazilian and Russian equity markets are the ones that dominate the return spillovers toward EMFSI. The impact of BVSP seems substantially stronger (approximately six times in median quantile) than MOEX in this regard. A comparison of results under each quantile shows that low and high quantiles mainly dominate spillovers. It means that transmission of returns from BRIC-T countries to EMFSI becomes considerably higher in the extreme lowest ($\tau = 0.05$) and extreme highest ($\tau = 0.95$) quantiles, namely, due to the high negative and high positive returns, respectively. The extent of spillovers during tranquil periods (median quantile) is almost half smaller than that of other periods.

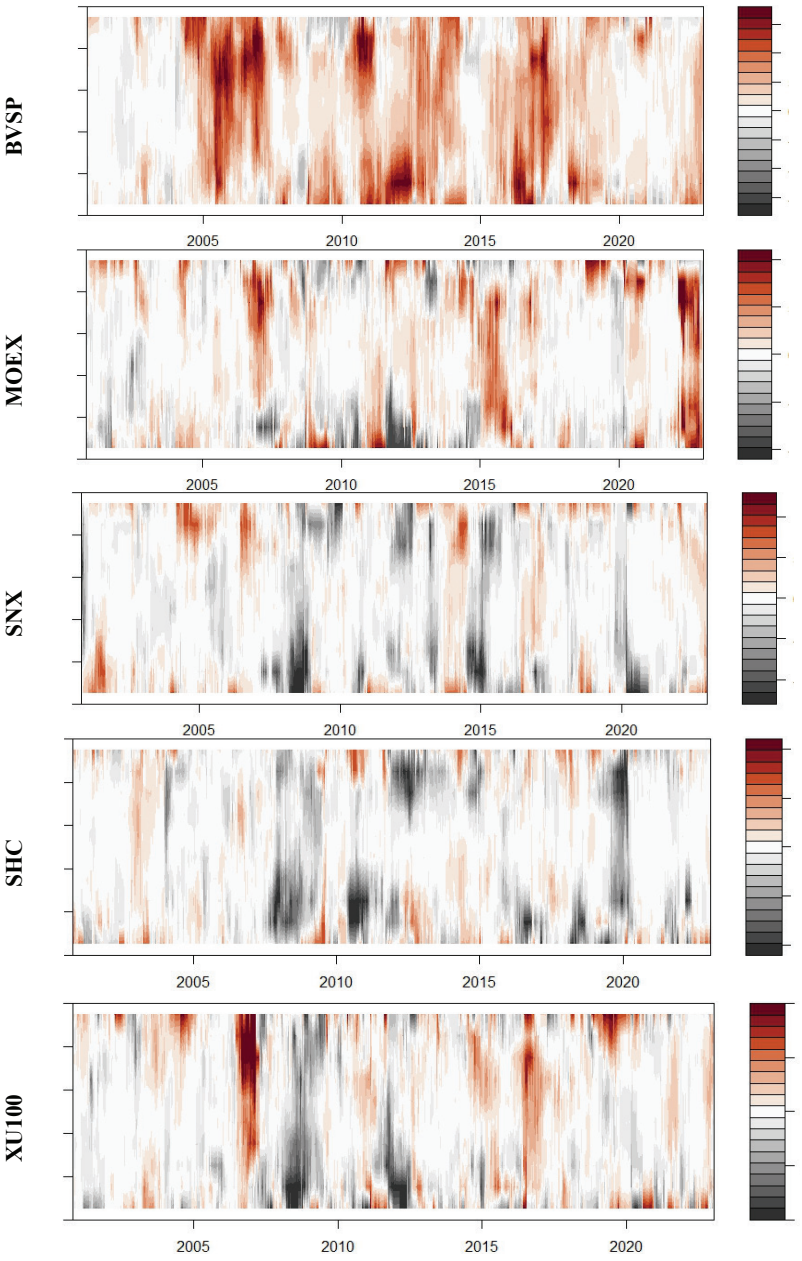
Figure 2: Net Total Directional Connectedness (mean values)



We plot the net total directional mean connectedness for each variable pair to understand the average behavior of these spillovers across the years. Results are presented in Figure 2 above. As shown, among the variables, the most stable results are obtained for the Brazilian equity market. Over the years, BVSP appears to be a net return transmitter most of the time. This observation is persistently violated only during 2009 and 2010. We also observe a similar but less persistent pattern in SNX and XU100. Although all equity markets occasionally illustrate negative values during the pandemic,

meaning each becomes a net receiver of the spillovers in varying extents, the Chinese stock market appears to be subject to intense and persistent spillovers from EMFSI. This finding can be attributed to the history of the pandemic. It seems that as an origin of the outbreak, China also comes to the fore in spillovers received in this period.

Figure 3: Net Total Directional Connectedness (various quantiles)



We plot multiple quantiles for each pair to examine further the behavior of pairwise net total directional connectedness results. Results are presented in Figure 3 above. The warmer shades in the diagram indicate the presence of more robust return transmissions from the respective equity market to EMFSI. Once again, the results show that among the BRIC-T countries, the highest return spillovers occur in the case of the Brazilian stock market. For BVSP, the net positive return transmissions to EMFSI occur mainly in four different phases: April 2004-April 2007 (mostly in high quantiles), April 2010-July 2012 (in high and low quantiles), July 2013-April 2014 (in high and low quantiles), January 2016-August 2017 (in high and low quantiles). The second in the ranking is the Russian equity market. Although the extent of the transmissions is significantly less than that of Brazil, spillovers from Russia became considerably high during April 2006-May 2007 (in high quantiles) and January 2015-January 2016 (around median quantile), in February 2022-January 2023 due to the war that broke out with Ukraine. The remaining countries demonstrate very limited spillovers to the EMFSI. Among all, Türkiye made substantially high transmissions around the median and high quantiles in April 2006-April 2007. Indian, Chinese, and Turkish equity markets appear to be the receiver of returns from EMFSI in particular periods, as shown by the figure's gray shades.

4. Conclusion

Emerging economies are crucial elements of the global economic system. The Emerging Market Financial Stress Index captures the risks and obstacles specific to these economies. In this study, we test the interactions between the Emerging Market Financial Stress Index and equity markets of BRIC-T countries (Brazil, Russia, India, China, and Türkiye) through return spillovers. As different market conditions, magnitude, and the sign of returns may induce varying results across the countries, we employed the Quantile VAR methodology in the empirical analysis.

The results show that return spillovers are substantially stronger in low and high quantiles than in the median. The net total directional connectedness measures indicate that Brazilian and Russian equity markets are the only markets that possess positive values (net transmitter of returns) under three selected quantiles; low $(\tau = 0.05)$, median $(\tau = 0.50)$ and high $(\tau = 0.95)$ quantiles. Other countries exhibit mixed results. However, we have seen that the higher quantiles yield greater positive net total directional connectedness statistics. Thus, we conclude that the experience of high positive returns turns each country into a transmitter rather than a receiver. Among the five equity markets, Brazil is the one that mainly leads the spillovers toward EMFSI. Obviously, the developments in this economy and their incorporation in stock prices induce substantially high spillovers. This finding is observed in high and low quantiles, meaning extremely low and extremely high returns. The spillovers found in April 2004-April 2007 (mostly in high quantiles), April 2010-July 2012 (in high and low quantiles), and January 2016-August 2017 (in high and low quantiles) are as strong as the return transmissions that occurred from the Russian stock market to EMFSI during the Russia-Ukraine war. Russia is the second country regarding the magnitude and persistence of return spillovers. Apart from the return transmissions during the war period, we witnessed considerably high spillovers in April 2006-May 2007 (in high quantiles) and January 2015-January 2016 (around median quantile).

The third country in generating pronounced spillovers toward EMFSI is Türkiye. Like Russia and Brazil, Türkiye also produced quite strong spillovers in April 2006-April 2007, around median and high quantiles. The extent and persistence of the spillovers in this period are greater than that of Russia and close to the level of Brazil. While it is relatively shorter, we also observe a similar period in May-November 2016 (in high and low quantiles) and November 2018-January 2020 (in high quantiles).

These findings indicate that among the BRIC-T countries, the most pronounced impacts are caused by Brazil and Russia (and partially Türkiye) in the transmission of returns to EMFSI. As two of the world's top oil and gas exporters, the return spillovers from Russia and Brazil indicate the importance of energy markets on emerging market stress. The income generated from commodity markets substantially contributes to both countries' balance of payments. However, it should be noted that changing paradigms in energy markets and decarbonization might produce more severe results in the economic stability of these two countries and, thus, in the stress level of emerging countries. As per our findings, we suggest both countries expedite the process of creating alternative income resources in foreign trade against the large price fluctuations in the energy market and clean energy transition. However, it should be noted that the consequences of the clean energy transition are bilateral in the context of emerging market stress, and countries form its index. The benefits obtained by the rest of the countries would shift the equilibrium to a point that maximizes utility for all participants and offer less vulnerability for the emerging markets against the energy market shocks, thus, less market stress.

References

Abdymomunov, A. (2013). Regime-Switching measure of systemic financial stress. *Annals of Finance*, 9, 455-470. doi.org/10.1007/s10436.012.0194-1.

Ando, T., Greenwood-Nimmo, M., & Shin, Y. (2018). Quantile Connectedness: modelling tail behaviour in the topology of financial networks. *Management Science*, 68(4). doi.org/10.1287/mnsc.2021.3984

Berger, D., & Pukthuanthong, K. (2016). Fragility, stress, and market returns, *Journal of Banking & Finance*, 62, 152-163. doi.org/10.1016/j.jbankfin.2015.11.003

Chatziantoniou, I., Gabauer, D., & Stenfors, A. (2021). Interest rate swaps and the transmission mechanism of monetary policy: A quantile connectedness approach. *Economics Letters*, 204. doi.org/10.1016/j.econlet.2021.109891

Christopoulos, A. G., Mylonakis, J., & Koromilas, C. (2011). Measuring the Impact of Financial Crisis on International Markets: An Application of the Financial Stress Index. *Review of European Studies,* 3(1), 22-34.

European Central Bank (2010). *The growing importance of emerging economies*. European Central Bank Monthly Bulletin. https://www.ecb.europa.eu/pub/pdf/other/mb201010_focus01.en.pdf

Hakkio, C. S., Keeton, & Wi. R. (2009). Financial stress: What is it, how can it be measured, and why does it matter. *Economic Review*, 94(Q II), 5-50.

Illing, M. & Liu, Y. (2006). Measuring financial Stress in a developed country: An application to Canada. *Journal of Financial Stability*, 2(3), 243-265. doi.org/10.1016/j.jfs.2006.06.002

Grimaldi, M. B. (2010). Detecting and interpreting financial stress in the Euro Area. *ECB Working Paper Series*, No. 1214, European Central Bank. www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1214.pdf.

Gusarova, S. (2019). Role of China in the development of trade and FDI cooperation with BRICS countries. *China Economic Review*, 57. doi.org/10.1016/j.chieco.2019.01.010

Mezghani, T., & Boujelbéne-Abbes, M. (ahead-of-print). Financial stress effects on financial markets: dynamic connectedness and portfolio hedging. *International Journal of Emerging Markets*, vol. ahead-of-print no. ahead-of-print. doi: 10.1108/IJOEM-06-2020-0619

Morazan, P., Knoke, I, Knoblauch, D., & Schafer, T. (2012). The role of BRICS in the developing world. European Parliament Directorate-General for External Policies of The Union Directorate B Policy Department, PE 433.779.https://www.ab.gov.tr/files/ardb/evt/1_avrupa_birligi/1_9_politikalar/1_9_8_dis_politika/The_role_of_BRICS_in_the_developing_world.pdf

Monin, P. J. (2019). The OFR financial stress index. *Risks*, 7(1), 25.

NBER (National Bureau of Economic Research). https://www.nber.org/news/business-cycle-dating-committee-announcement-july-19-2021

Rezagholizadeh, M., Elmi, Z., & Mohammadi, M. S. (ahead-of-print). The effect of financial stress on the stock return of accepted industries in Tehran Stock Exchange. Quarterly Journal of Quantitative Economics, vol. ahead-of-print no. ahead-of-print. doi: 10.22055/jqe.2021.35405.2284

Sachs, G. (2003). Dreaming with BRICs The Path to 2050 written by Dominic Wilson and Roopa Purushothaman, *Global Economics Paper* No: 99.

Singh A. & Singh, M. (2016). Investigating Impact of US, Europe, Frontier and BRIC Stock Markets on Indian Financial Stress Index, *Journal of Banking and Financial Economics*, 2(6), 22-44. doi: 10.7172/2353-6845.jbfe.2016.2.2

Soltani, H., Abbes, M, B., & Aloulou, A. (2021). Investigating the relationship between financial stress index and MENA stock markets performance. *International Journal of Finance and Banking Research*,7(5), 111-122. doi: 10.11648/j.ijfbr.20210705.12

Stock, J., Elliott, G., & Rothenberg, T. (1996). Efficient tests for an autoregressive unit root. *Econometrica*, 64(4).

Sum, V. (2014). Dynamic effects of financial stress on the U.S. real estate market performance. *Journal of Economics and Business*, 75, 80-92. doi.org/10.1016/j.jeconbus.2014.06.002

Sum, V. (2013). Impulse Response Functions and Causality Test of Financial Stress and Stock Market Risk Premiums. *International Journal of Financial Research*, 4 (1), 1-1. doi:10.5430/ijfr.v4n1p1

Office of Financial Research. Financial Stress Index. https://www.financialresearch.gov/financial-stress-index/

The World Bank. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

Xu, Y., Liang, C., & Wang, J. (2023). Financial stress and returns predictability: Fresh evidence from China. *Pacific-Basin Finance Journal,* 78. doi.org/10.1016/j.pacfin.2023.101980