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Do the carry trades respond to geopolitical risks? Evidence from BRICS countries

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A B S T R A C T

This paper aims to analyze the implications of geopolitical risks on the return and volatility of carry trade transactions in the context of BRICS countries for the period 2006–2020. Fixed effects regressions considering the sample countries as a single portfolio document that geopolitical risks are correlated with volatility, while the results are inconclusive for returns. The non-parametric time-varying coefficients panel data estimations further indicate that the effect of geopolitical risks on carry trade volatility is amplified during the Global Financial Crisis and the post-2016 episode. Moving to the disaggregated data, the time-varying robust Granger causality test of Rossi and Wang (2019) show that geopolitical risks have a significant in-sample predictive power for both carry trade return and volatility during a myriad of sub-periods, which can not be captured by standard constant parameter techniques in the presence of instabilities. Overall, our empirical results suggest that the exposure to geopolitical risks should be taken into account by global investors for risk diversification purposes when entering carry trade positions in BRICS countries.

1. Introduction

Carry trade has become one of the most prevalent trading strategies in financial markets in recent decades (BIS, 2019). The strategy is based on borrowing in low-interest rate currencies and investing in high-yielding ones. More specifically, carry trade investors strive to profit from the interest rate differential by assuming the risk of depreciation in the investment currency. According to the well-known uncovered interest rate parity (UIP) in the finance literature, such interest rate differences will be offset by an equal devaluation of the investment currency and the expected carry trade return will be equal to zero. However, starting with the Hansen and Hodrick (1980), Bilson (1981), and Fama (1984), there emerges a strand of the literature revealing the possibility of retaining positive excess returns through carry trade strategies, relative to stock markets and fixed income instruments.[1]

The carry trade strategy is performed by buying the currencies which deliver the highest returns and selling the lowest yielding ones. In the context of carry transactions, the comparison of currencies mostly entails a theoretical positive relationship between

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[1] See Burnside et al. (2011), Neely and Weller (2013), Das et al. (2013), and Doskov and Swinkels (2015) for details.

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interest rate and volatility. However, this correlation is far from perfect in real life such that when they choose between two currencies delivering similar returns, investors are inclined to buy the one with the subdued risk, i.e., the lowest volatility. Historically, reversals in financial conditions and monetary policy stance in countries with funding currencies have tended to cause unwinding of the carry trades, facilitating volatility jumps in financial markets. This happened in mid-2004 when the Federal Reserve (Fed) started to signal a reversal and in mid-2006 when the Bank of Japan (BoJ) declared the end of quantitative easing and the departure from the zero-interest rate policy. The unwinding of the carry trades tended to exaggerate the impact of tightening by advanced countries' monetary authorities on global liquidity conditions. More recently, to balance the detrimental effect of COVID-19 on real economic activity, central banks of developed countries have initiated a comprehensive package of monetary policy measures involving quantitative easing, expansion of monetary base and interest rate cuts. In turn, this low-yield environment has encouraged investors to borrow in the low-yield currency to invest in high-yield currencies such as BRICS countries where central banks responded to inflation surprises by raising interest rates, which created sizeable returns for carry trades. On the contrary, investors are wary of investing in high yield currencies during periods of potential rises in interest rates in developed countries due to the narrowing of interest rate differentials.

Although several factors that affect carry trade returns have been indicated in the relevant literature, to the best of our knowledge, any other prior study analyzing the role of geopolitical risks in shaping carry trade dynamics does not exist. Heightened geopolitical tensions potentially distort investor sentiment, result in excessive volatility and diminish carry trade activities in global financial markets. Especially, recent events (such as the US-China trade disputes, Brexit, Syrian war, Libya tensions, and COVID-19 pandemic) have elevated global geopolitical tensions dramatically and caused disruptions in investor behavior and asset pricing.[2] In this regard, first, we examine that how geopolitical risks affect the carry trade return and volatility dynamics relevant to the currency portfolio of BRICS countries; namely, Brazil, Russia, India, China, and South Africa. Second, we identify the intervals during which the effect of geopolitical risks on carry trade return and volatility is amplified or weakened. Third, working with country-level data, we empirically test whether geopolitical risks have an informative value in predicting the anticipated carry trade return and volatility. Our paper is closely aligned with the particular strand of the literature that connects carry trade return and risk factors such as global foreign exchange volatility (Menkhoff et al., 2012), sovereign risk (Corte et al., 2016), and economic policy uncertainty (Berg and Mark, 2018). Specifically, our study contributes to the literature on carry trade returns and risk factors by showing that geopolitical risks also represent a profound source of variation. From a global investors' perspective, a better understanding of carry trade dynamics can shed light on ex-ante developments in terms of modeling the uncovered interest rate parity shocks.

The existing literature working on the geopolitical risks and financial markets consists of papers that focus on stock returns and volatility (Kollias et al., 2010, 2011a,b, 2013a, Balcilar et al., 2016, Bouri et al., 2018, Apergis et al., 2017, Balcilar et al., 2018, and Bouras et al., 2018), FX rates (Balcilar et al., 2017), oil prices (Kollias et al., 2013b), gold returns (Gupta et al., 2017), and recessions (Clance et al., 2019). On the other hand, our empirical analysis highlights the effects of geopolitical risks on carry trade dynamics. To this end, we utilize the monthly news-based geopolitical risk (GPR) index developed by Caldara and Iacoviello (2018) to measure geopolitical risks. We investigate the impact of the GPR index on carry returns and volatility for the period 2006–2020. In the first step, we employ static and time-varying panel regressions to examine the correlation between the course of geopolitical tensions and carry trade transactions by considering sample countries' currencies as a single portfolio. In the second step, we turn our attention to individual country dynamics by utilizing the time-varying Granger Causality approach introduced by Rossi and Wang (2019)[3] to detect the periods when geopolitical risks predict carry trade return and volatility significantly, whereas such predictive power can not be captured by traditional time-series analysis techniques in the presence of instabilities. The empirical results show that geopolitical risks have significant impacts on the carry trade returns and volatility for individual BRICS countries over a myriad of subperiods when instabilities are taken into consideration. Overall, our results hint that the global investors should consider geopolitical risks as an independent source of variation when deciding on carry trade positions related to BRICS countries in their portfolios.

The remainder of the paper is structured as follows: Section 2 presents the literature review. Section 3 provides information about the main features of the data set. Section 4 outlines the empirical design and methodology. Section 5 discusses the main findings. The concluding remarks are given in Section 6.

2. Literature review

2.1. Carry trade returns and risk factors

The negative relationship between interest rate differentials and exchange rate changes is known as the -IJforward premium puzzle-İ in the financial economics discipline. Several papers in the prior literature attempt to understand this puzzle by investigating the factors that affect carry trade returns. By using a group of advanced countries' currencies, Burnside et al. (2006) show that positive excess returns of carry trade portfolios are related to transaction costs and price pressures but can not be attributed to standard risk factors. By working with a consumption-based model, Lustig and Verdelhan (2007) find that aggregate consumption

[2] The recent rise in the level of the geopolitical risk index of Caldara and Iacoviello (2018) highlights the increasing intensity of geopolitical tensions.

[3] A vast majority of empirical papers utilizes the approach of Rossi and Wang (2019) for causal inference between financial variables, such as bond and oil market (Coronado et al., 2021); household debt and inequality (Berisha et al., 2020); economic policy uncertainty and capital flows (Cepni et al., 2020); financial stress and inequality (Balcilar et al., 2021), trade policy uncertainty and economic growth (Cepni et al., 2020).

growth risk is a key factor for carry trade returns. More specifically, in an environment characterized by subdued consumption growth, assets providing low returns deemed to be riskier for investors. Hence, economic agents with excess funds wish to be compensated by having a positive abnormal carry return.

On the other hand, Bhansali (2007) proposes that carry trade is a de-facto form of short volatility trade and finds that foreign exchange (FX) option-based strategies are able to yield excess returns, when they involve funding currencies like Japanese Yen (JPY) and Swiss Franc (CHF) as well as carry currencies like Australian Dollar (AUD), New Zealand Dollar (NZD), US Dollar (USD), Mexican Peso (MXN) and Brazilian Real (BRL). In another paper, Brunnermeier et al. (2009) validate the strong correlation between carry return skewness and interest rate differentials by utilizing the sample of 8 developed countries and the Euro area. In this context, carry trade strategy is subject to the crash risk that is intensified by the sudden reduction in carry trade positions when traders face liquidity constraints. Melvin and Taylor (2009) introduce a financial stress index measuring the financial volatility with considerable predictive power for carry trade returns in a group of 17 developed countries. Burnside et al. (2009) emphasize the role of adverse selection problems and associated risks, faced by traders and market makers, in understanding excess carry trade returns.

2.2. Carry trade returns and volatility

Another strand of the literature concentrates on the role of financial asset volatility in carry trade dynamics. Clarida et al. (2009) empirically show that there exists a negative relationship between carry trade excess returns and exchange rate volatility through portfolios constructed with G10 currencies. Bacchetta and van Wincoop (2010) ascribe excess carry returns to the infrequent portfolio decisions of investors. In a concurrent study, Ranaldo and Söderlind (2010) highlight the correlation between carry returns (retrieved from currency pairs USD/CHF, USD/DEM, USD/EUR, USD/JPY and USD/GBP) and the volatility index (VIX) by showing that safe-haven currencies tend to appreciate with rising stock market volatility. Based on the perspective of contagion issues, Christiansen et al. (2011) also find that the level of FX volatility has an impact on the risk exposure of carry trade returns to stock and bond markets in the context of G20 countries. Lustig et al. (2011) focus on a cross-country sample and detect a slope factor in currency returns, which is in charge of most of the cross-sectional variations in excess carry returns. Simultaneously, Burnside et al. (2011) investigate the dynamics of carry trade for G20 countries and show that excess carry returns are not correlated with standard risk factors. Instead, they claim that high carry trade returns are related to what is conceptualized as -IJpeso problem-İ asserting that the future unprecedented change of pricing factors or economic variables might induce a dramatic decrease in carry trade returns due to a sharp depreciation of the currency. Menkhoff et al. (2012) empirically analyze the risk-return profile of carry trades in 48 developed and emerging countries, while indicating that global FX volatility risk is the most crucial factor in explaining excess carry returns.

2.3. Carry trade returns and link with other asset returns

Another group of studies in the existing literature aims to analyze the interaction between carry trade returns and returns realized in other financial assets. Fung et al. (2013) reveal the high correlation between carry trade returns of G10 and 8 major Asian currencies and stock market prices of prominent Asian countries including Japan, Australia, India and Korea. By employing a multivariate regression model, Doukas and Zhang (2013) show that capital controls, market liquidity, global FX volatility, and the crash risk negatively affect carry trades in a sample of 66 countries' currencies quoted against USD. Bakshi and Panayotov (2013) examine the time series predictability of currency carry trades in a group of G10 countries and find that commodity returns, FX volatility, and global liquidity significantly predict carry trade trends. With the help of predictive quantile regressions and a wide data set comprising 10 advanced and 12 emerging markets, Cenedese et al. (2014) document that the variance of the FX market has a significant negative effect on carry trade returns. Jurek (2014) investigates the carry returns for cross-pairs of G10 currencies. The empirical results of that paper show that crash-hedged carry returns are positive and (in contrast to the results of Burnside et al., 2011) higher carry returns are not associated with peso problems. Dobrynskaya (2014) introduces a global downside market factor and finds that carry trade returns are negatively influenced by financial distress episodes within weighted portfolios constructed for a large cross-country sample.

Similarly, Lettau et al. (2014) utilize a downside risk capital asset pricing model and an inclusive sample of developed and emerging markets to conclude that carry trade returns are related to the aggregate market risk. By using a no-arbitrage model of exchange rates, Lustig et al. (2014) present that the average forward discount relative to the USD strongly predicts excess carry returns regarding a cross-country basket of currencies. Farhi and Gabaix (2016) introduce a novel disaster-based tractable framework for exchange rates, which accounts for major puzzles such as high excess returns of carry trade activities. Mueller et al. (2017) show that excess carry returns relevant to G10 currencies are also exposed to a negative price of correlation risk. Finally, by applying the concept of carry to any asset Koijen et al. (2018) find that carry returns cannot be explained by global return factors such as value, momentum, and time-series momentum. Instead, carry strategies generally tend to incur losses during periods of worsened liquidity and heightened volatility such as global recessions.

3. Data

Our data set includes the BRICS countries; namely, Brazil, Russia, India, China, and South Africa. These five major emerging economies have recorded rapid growth rates in recent decades and currently represent around 42% of the population, 23% of the global GDP, 30 % of the worldwide territory, and 18 % of the international trade.[4] The earlier phases of financial liberalization accompanied by the increasing volume of global trade have allowed these countries to integrate with the developed markets through financial and investment linkages (Mensi et al., 2016). Global investors also started display more attention to the domestic financial markets of the BRICS countries thanks to their growth potential and relatively larger yields. Hence, it is useful for global investors to grasp a better understanding of the financial dynamics underlying BRICS economies.

We use the monthly data on the GPR index based on the work of Caldara and Iacoviello (2018). They construct a global version of the GPR index alongside 19 country-specific indices by counting the occurrence of words related to geopolitical events and risks from 11 well-known newspapers; namely, The Boston Globe, the Chicago Tribune, The Daily Telegraph, the Financial Times, The Globe and Mail, The Guardian, the Los Angeles Times, The New York Times, The Times, The Wall Street Journal, and The Washington Post.[5] The search words are classified into six groups; geopolitical threats, nuclear threats, war threats, terrorist threats, war acts, and terrorist acts. The monthly GPR index is created by taking the ratio of the number of articles mentioning rising geopolitical risks to the total number of all published articles in a certain time interval. The index is normalized to the average value of 100 for the 2000–2009 period. Hence, a monthly GPR index value of, say 200, implies that newspaper articles of rising geopolitical risks in that month were twice as frequent as they were throughout the 2000 s.[6]

Carry trade returns (CR) are calculated by taking the monthly log-difference of Bloomberg Carry Index (BCI) representing the return from borrowing the short currency to fund buying the long currency and earning interest. In other words, carry trade returns are computed by adding the spot return to the interest earned from the long currency position and subtracting the interest owed from the short currency position. Table 1 presents correlations between geopolitical risk and carry trade returns across sample countries. The fact that global investors tend to see emerging markets as a single asset class brings a high level of correlation in carry trade returns across countries (Miyajima and Shim, 2014. The correlation coefficients of carry returns across countries range from 0.15 to 0.63. Furthermore, there seems to be a negative relationship between carry trade returns and geopolitical risks as expected (Table 1).

As another variable of interest in our empirical design, in line with Andersen and Bollerslev (1998), 30-day realized volatility of the carry returns are calculated based on the square root of realized variance.[7] In addition to these, in our time-varying Granger causality specifications, we also incorporate Chicago Board Options Exchange Volatility Index (VIX), 1-month foreign exchange implied volatility (FXVOL) and country total reserves (CTR) - including FX and gold - as control variables to capture local and global risk factors, as suggested by Menkhoff et al. (2012), Dominguez et al. (2013), and Egbers and Swinkels (2015). We present the descriptive statistics for carry trade returns and volatility in Table A1 of the appendix.

Our sample covers the monthly period of 2006:01–2020:01, driven by the historical data availability of the variables. All data is retrieved from Bloomberg Terminal and transformed into stationary forms by the appropriate methods whenever they are determined to be non-stationary.

4. Methodology

4.1. Static and time varying panel regression

Before assessing the time-varying predictability, the first part of our empirical design analyzes the correlation between different features of carry trade transactions and the geopolitical risks on the aggregate level. In this context, we employed baseline regression model as follows:

$$Carry_{it} = \alpha_0 + \alpha_1 GPR_{it} + f_i + v_t + \varepsilon_{it} \tag{1}$$

where $Carry_{it}$ refers to return and volatility indicators of carry trade transactions for country i at time t. In this specification, GPR_{it} is the main variable of interest proxying the geopolitical risks for each country in the sample, whereas f_i and v_t stand for country and time fixed effects, respectively. Same specification is also estimated with one-period lagged GPR_{it} variable to account for delayed effects. Although this approach is plain and subject to several limitations, it can provide information about the static correlation between carry trade transactions and geopolitical risks on the longitudinal level before proceeding with empirical models revealing dynamic predictive power. In addition to this, we also implemented non-parametric panel regression model with time-varying coefficients by using the local linear dummy variable estimator developed by Li et al. (2011) and operationalized by Diallo (2014). This method can demonstrate how the impact of a particular covariate changes over time by controlling for richer panel characteristics, fixed effects and cross-sectional dependence into consideration.

4.2. Time varying robust Granger-causality

In the subsequent steps, the time-varying robust Granger-causality method of Rossi and Wang (2019) is employed in our analysis since it has many advantages compared to the classical Granger causality. One particular advantage is that the time-varying Granger causality robust tests are more powerful than the traditional static Granger causality test in the presence of instabilities (Rossi, 2005). This approach can also be used to detect the periods when Granger-causality exists or breaks down in the data. Furthermore, the

[4] See, http://brics2019.itamaraty.gov.br/en/about-brics/what-is-bricsfor details.

[5] Country-specific GPR indices are available for Turkey, Mexico, South Korea, Russia, India, Brazil, China, Indonesia, Saudi Arabia, South Africa, Argentina, Colombia, Venezuela, Thailand, Ukraine, Israel, Malaysia, Phillippines, and Hong Kong

[6] GPRs index can be downloaded from Matte Iacoviello's website at https://www.matteoiacoviello.com/gpr.htm

[7] Realized variance is calculated by computing the aggregate of squared returns over the 30-days period.

Table 1
Correlation between geopolitical risk and carry trade returns across countries.

	Brazil_CR	*Russia_CR*	*India_CR*	*China_CR*	*S.Africa_CR*	*Brazil_GPR*	*Russia_GPR*	*India_GPR*	*China_GPR*	*South_Africa_GPR*
Brazil_CR	1.00	0.44	0.57	0.16	0.63	− 0.01	− 0.08	− 0.04	− 0.12	− 0.05
Russia_CR	0.44	1.00	0.35	0.26	0.40	0.02	− 0.03	− 0.03	− 0.04	0.06
India_CR	0.57	0.35	1.00	0.15	0.54	− 0.07	0.04	0.00	− 0.07	− 0.01
China_CR	0.16	0.26	0.15	1.00	0.20	− 0.07	− 0.02	− 0.10	− 0.14	0.01
S.Africa_CR	0.63	0.40	0.54	0.20	1.00	0.06	0.03	0.01	− 0.05	− 0.10
Brazil_GPR	− 0.01	0.02	− 0.07	− 0.07	0.06	1.00	0.29	0.28	0.54	− 0.09
Russia_GPR	− 0.08	− 0.03	0.04	− 0.02	0.03	0.29	1.00	0.22	0.45	− 0.02
India_GPR	− 0.04	− 0.03	0.00	− 0.10	0.01	0.28	0.22	1.00	0.41	0.06
China_GPR	− 0.12	− 0.04	− 0.07	− 0.14	− 0.05	0.54	0.45	0.41	1.00	− 0.11
South_Africa_GPR	− 0.05	0.06	− 0.01	0.01	− 0.10	− 0.09	− 0.02	0.06	− 0.11	1.00

Note: This table presents relation between geopolitical risk and carry trade returns for our sample countries. We use the following abbreviations; CR: carry trade returns and GPR: geopolitical risk. We following the following labeling convention: country name _ variable content.

approach helps us to examine the time-varying causal relationships between geopolitical risk index and carry trade return and volatility, and hence provides a more appropriate picture of the relationship over time than a constant parameter Granger causality method. In particular, we consider a reduced-form VAR with time-varying parameters as the following:

$$\begin{aligned} A_t(L)y_t &= u_t \\ A_t(L) &= I - A_{1,t}L - A_{2,t}L^2 - \cdots - A_{p,t}L^p \\ & u_t \overset{i.i.d}{\sim} (O, \Sigma) \end{aligned} \tag{2}$$

where $y_t = [y_{1,t}, y_{2,t}, ..., y_{n,t}]'$ is an $n \times 1$ vector, and $A_{j,t}$, $j = 1, \ldots, p$, are $n \times n$ time-varying coefficient matrices. In our case, endogenous variables vector y_t in the VAR model includes VIX, FXVOL, CTR and country-specific GPR index and alternatively, carry trade return or volatility of corresponding BRICS country.

Besides, we utilize a direct multi-step VAR-LP forecasting model with time-varying parameters to examine the forecasting ability of geopolitical risk index for return and volatility of the carry trades.[8] By iterating Eq. (1), y_{t+h} can be projected onto the linear space generated by $(y_{t-1}, y_{t-2}, ..., y_{t-p})'$ using the following equation:

$$y_{t+h} = \Phi_{1,t}y_{t-1} + \Phi_{2,t}y_{t-2} + \cdots + \Phi_{p,t}y_{t-p} + \epsilon_{t+h} \tag{3}$$

where $\Phi_{j,t}$'s are functions of $A_{j,t}$, for $j = 1, \ldots, p$ in Eq. (1), and ϵ_{t+h} is a moving average of the error term u_t from time t to $t + h$. This show that Eq. (1) is a special case of Eq. (2) where h = 0 is set. Hence, we continue with our analysis with Eq. (2) from now onward.

Suppose that θ_t is appropriate subset of $\text{vec}(\Phi_{1,t}, \Phi_{2,t}, ..., \Phi_{p,t})$. We test the null hypothesis that geopolitical risk index does not Granger cause the carry trade return or volatility of the corresponding BRICS country where the null hypothesis is that:

$$H_0: \theta_t = 0, \quad \forall\ t = 1, 2 \ldots T \tag{4}$$

To this end, following from Rossi (2005), we report four alternatives test statistics, namely: the exponential Wald (ExpW), mean Wald (MeanW), Nyblom (Nybolm) and Quandt Likelihood Ratio (SupLR) tests.[9] The lag length of the VAR model is selected one based on the Schwarz Information Criterion (SIC). Moreover, we assume heteroskedastic and serially correlated idiosyncratic shocks and choose the standard trimming parameter 0.05 in an effort to cover as much of data.[10]

5. Results

5.1. Static and time varying panel regression results

The first set of empirical results includes baseline co-movements between carry trade and geopolitical risks for selected EM countries as a whole sample group. Table 2 presents fixed effects panel regression results both for return and volatility of carry trade transactions as dependent variables. There seems to be a negative but insignificant relationship between carry trade return and geopolitical risk. This finding does not change when we control for country and time fixed effects. Similar result is also evident when lagged GPR index is considered instead of contemporaneous one. On the other hand, a significant and positive relationship between carry trade volatility and GPR index can be captured at the aggregate level, as shown in columns (5) through (8). This correlation is not altered when we account for country and time fixed effects as well as lag dynamics. Hence, it is highly likely that the payoff structure for carry trade transactions (derived from EM assets bundled as single trading group) could be more dispersed for foreign investors when local geopolitical risks are also amplified.

We further investigate the dynamic aspects of this correlation by implementing the non-parametric time-varying coefficients panel data model with fixed effects outlined by Li et al. (2011). Fig. 1 depicts the time-varying impact of the GPR index on carry trade volatility. The effect of geopolitical risks on carry trade volatility of sample countries turns out to be much sizeable during the periods following the Global Financial Crisis as well as post-2016 interval aftermath of the US elections. A similar trend is evident when we examine the effect of lagged GPR indicator. However, it should be noted that these baseline models focus on the longitudinal data as a whole and they are not designed to analyze the country-specific dynamics. Furthermore, while they hint about the correlation and joint movements, these specifications are not capable of presenting the dynamic predictive power in a causal sense. Thus, we continue our empirical analysis with robust time-varying Granger causality method on individual country-level in the following sections.

5.2. Time varying robust Granger-causality results

The first set of results derived from the reduced-form VAR model with time-varying parameters is presented in the top panel of Table 3. The first column of Table 3 shows that the standard constant parameter Granger causality test finds no evidence of causality between geopolitical risks and carry trade return/volatility except for China where the null hypothesis of the non-existence of Granger causality channeled from geopolitical risks index to carry trade volatility is rejected with a significance level 5%. On the contrary, regardless of the test-statistic considered (ExpW, MeanW, Nyblom, SupLR), there exists a consensus among findings

[8] The model is estimated via Local Projections of Jordà (2005). See Jordà (2005) for more details of Local Projections.

[9] See Rossi (2005) for more detailed explanations of these statistics.

[10] As is typical in the structural break literature, the potential break dates are usually trimmed to omit the beginning and end of the sample period.

Table 2
Panel Regression Results.

	(1) Return	(2) Return	(3) Return	(4) Return	(5) Volatility	(6) Volatility	(7) Volatility	(8) Volatility
GPR(t)	− 0.546	− 0.415			3.841***	3.707***		
	(0.382)	(0.374)			(0.810)	(0.809)		
GPR(t-1)			− 0.440	− 0.108			4.355***	4.332***
			(0.442)	(0.456)			(0.733)	(0.730)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	845	845	840	840	845	845	840	840
Adj. R-squared	0.002	0.352	0.003	0.351	0.441	0.557	0.445	0.561

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

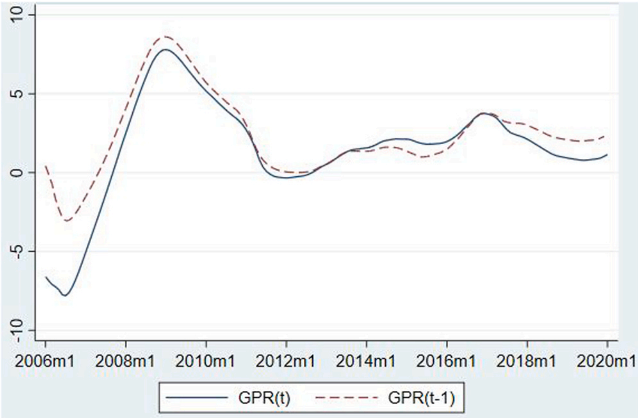

Fig. 1. The impact of geopolitical risks on carry trade volatility.

Table 3
Time-varying parameter Granger causality tests.

Return	χ_q^2	ExpW	MeanW	Nyblom	SupLR
Brazil	0.37	75.31	38.35	2055.62	159.49
	(0.544)	(0.000)	(0.000)	(0.000)	(0.000)
Russia	0.01	125.68	21.79	1319.69	261.40
	(0.916)	(0.000)	(0.000)	(0.000)	(0.000)
India	0.20	31.07	13.18	1371.32	71.51
	(0.656)	(0.000)	(0.000)	(0.000)	(0.000)
China	0.00	79.83	29.96	2138.98	169.67
	(0.990)	(0.000)	(0.000)	(0.000)	(0.000)
South Africa	0.21	182.33	51.52	2813.03	374.70
	(0.645)	(0.000)	(0.000)	(0.000)	(0.000)
Volatility					
Brazil	3.02	73.89	37.64	2946.59	157.80
	(0.082)	(0.000)	(0.000)	(0.000)	(0.000)
Russia	0.12	253.24	45.55	2566.65	516.51
	(0.736)	(0.000)	(0.000)	(0.000)	(0.000)
India	0.59	49.89	21.72	6670.71	109.70
	(0.442)	(0.000)	(0.000)	(0.000)	(0.000)
China	6.36	283.88	112.09	32,219.62	577.80
	(0.012)	(0.000)	(0.000)	(0.000)	(0.000)
South Africa	1.84	58.75	27.35	1085.73	127.17
	(0.175)	(0.000)	(0.000)	(0.000)	(0.000)

Note: Entries correspond to the four alternative test statistics namely: the exponential Wald (ExpW), mean Wald (MeanW), Nyblom and Quandt Likelihood Ratio (SupLR) tests. Similarly, χ_q^2 shows the chi-square statistic of constant parameter Granger causality test where the lag length q is selected based on BIC. The corresponding p-values are given in parenthesis.The null hypothesis is that geopolitical risk index does not Granger cause corresponding to the carry return or volatility of the country j where j = Brazil, Russia, India, China, and South Africa.

Table 4
Robust Granger-causality tests in the direct multi-step VAR-LP forecasting model.

Return	h = 1 (1-day)				h = 5 (1-week)				h = 22 (1-month)			
	ExpW	MeanW	Nyblom	SupLR	ExpW	MeanW	Nyblom	SupLR	ExpW	MeanW	Nyblom	SupLR
Brazil	62.07	28.40	2009.11	134.17	54.07	20.98	3250.28	118.12	253.44	22.65	1527.00	516.64
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Russia	97.79	48.73	7207.03	205.55	65.81	34.30	19,362.62	141.60	208.33	53.20	8687.82	425.90
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
India	20.83	6.90	254.88	51.05	106.67	20.70	2328.21	223.33	105.15	31.70	1492.08	220.07
	(0.000)	(0.118)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
China	36.62	20.37	4801.22	82.81	66.34	31.89	7013.30	142.67	63.62	19.52	1329.45	136.69
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
South Africa	236.39	43.33	1315.67	482.80	162.79	60.73	4347.87	335.57	134.37	49.63	278.48	278.51
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Volatility												
Brazil	41.27	23.88	507.01	92.54	112.72	34.40	361.07	235.40	1357.86	165.12	1177.61	2374.79
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Russia	228.61	88.38	5206.43	466.76	310.63	116.69	33,233.62	631.24	352.15	137.66	1908.01	714.06
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
India	140.98	68.40	7497.40	291.99	134.34	31.01	418.35	278.68	532.92	321.96	2815.93	1075.62
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
China	179.95	92.36	21,326.51	369.93	421.30	120.51	2012.80	852.60	315.98	106.77	1332.17	641.72
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
South Africa	65.74	48.46	1869.45	141.49	499.70	99.25	7583.61	1009.39	672.92	199.24	642.80	1355.62
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: Entries correspond to the four alternative test statistics namely: the exponential Wald (ExpW), mean Wald (MeanW), Nyblom and Quandt Likelihood Ratio (SupLR) tests. The corresponding p-values are given in parenthesis. We assume heteroskedastic and serially correlated idiosyncratic shocks. h = 1, 5, 22 represent h-step ahead forecasts (i.e. 1-day-ahead, 1-week-ahead and 1-month-ahead forecasts using VAR-LP forecasting model.

asserting that geopolitical risks Granger cause the carry trade return/volatility for sample countries when instabilities and time-varying nature are accounted for. In other words, the null hypothesis of the robust Granger causality test can be rejected at conventional significance levels emphasizing the information content of geopolitical risks regarding the in-sample behavior of carry trade return/volatility in the BRICS currencies. Here, one striking finding is that geopolitical risks are assigned more significant in predicting carry trade strategies, when we consider the South African Rand as target currency compared to other sample countries since test statistics associated with this country are larger. Test results provided in the bottom panel of Table 3 show that the course and extent of geopolitical risks are also significant pricing factors for carry trade volatility. This finding is again robust to the choice of the test statistic. Therefore, the outlook of geopolitical risks emerges as an important element of anticipating carry trade volatility. In this case, test results are more indicative for the Chinese Renminbi compared to other BRICS currencies as the related test statistics attached to China assume larger values.

Our estimations also involve robust Granger causality tests based on direct multi-step VAR-LP forecasting over 3, 6, and 9-months horizons. Pseudo-out-of-sample forecasting results derived from this method are given in Table 4. When we examine the top panel of the table, the null hypothesis can be rejected at conventional significance levels hinting that lag values of geopolitical risk indices influence the future values of the carry trade returns. This finding describes the informative nature of geopolitical risks in terms of the out-of-sample forecasting practices for the returns obtained in carry trade strategies. The aforementioned results are robust to the choice of the test statistic, individual country sub-samples and the different forecast horizons. The lower panel of Table 4 presents the results highlighting the significance of geopolitical risks in the VAR-LP forecasting setting regarding the variation in carry trade volatility.

Apart from the results describing the overall situation across the sample period, time-wise empirical identification is conducted through time-varying Wald statistics obtained from robust Granger-causality tests (Figs. 2 and 3). Although the Wald statistic testing the relevance of the variable of interest for returns exceeds the threshold levels during almost all of the sample period for Brazil, the impact is more pronounced during the initial phases of the sample including the Global Financial Crisis. The Brazilian economy was hit hard financially by the Great Recession given the domestic liquidity squeeze, depreciation of the local currency, capital outflows and exposure of non-financial corporations to swings in derivative instruments (Mesquita and Torós, 2010, Sobreira and de Paula, 2010, Bussolo et al., 2014, Bonomo et al., 2015). However, policies taken following the crisis including the relaxation of reserve requirement policies, direct credit supply incentives, and fiscal measures combined with the resilient macroeconomic outlook of the country led to a strong recovery in a shorter period. This economic rebound process is also thought to facilitate the sudden decrease in the impact of geopolitical risks as well. However, we observe more permanent fluctuations when we examine the course of Wald statistic for carry trade volatility over the sample period. In addition to crisis-era, in particular, the Granger-causality relationship seems to be strengthened during post-2013 and post-2018 episodes. Criticism against public services together with the sizeable government spending initiated for the 2014 World Cup tournament resulted in civil unrest in Brazil (Mitra, 2015). The political instability accompanying the removal of former president Dilma Rousseff also contributed to the rise of geopolitical risks during the same timeline (De Carvalho, 2016, Doval and Actis, 2016). Moreover, the trade protectionism measures promoted by the trade policy of the incumbent US presidency contributed to the risk levels. All these factors are assessed to be reflected in the role of geopolitical risks in financial fluctuations as well as the carry trade volatility.

Empirical results related to the Russian case exhibit a rather unique picture. In terms of the carry trade return, the time-varying impact is significant in the post-2015 period, whereas the GPR index Granger causes carry trade volatility significantly only during the period preceding the Global Financial Crisis. Notwithstanding the loss of economic output and labor productivity as well as the financial market disruptions due to spillover effects aftermath the crisis, in contrary to other peer countries, Russia experienced another economic slowdown/recession phase in 2014–2015 following the acceleration of geopolitical risks stemming from the Ukrainian crisis (Mensi et al., 2016, Akindinova et al., 2017, Voskoboynikov, 2017). The main drivers of this process were the sanctions imposed on the Russian economy due to the political tensions (Wang, 2015, Neuwirth and Svetlicinii, 2016, Veebel and Markus, 2016). The situation was exacerbated by the coincident plunge in global oil and commodity prices leading to a weakening in public finance, macroeconomic performance and financial conditions of the Russian economy given the structural dependence on oil and commodity export rents (Rautava, 2004, Benedictow, 2013). Similarly, recent periods, during which the impact of geopolitical conjuncture on carry trade returns are found to be significant, also involved with diplomatic and trade-related tensions leading to prominent depreciation in Russian Ruble.[11]

The estimation results specific to India reveal that the significance of time-varying Granger causality is evident only during brief periods around 2008 and 2018, in the context of carry trade returns. However, the relevance of geopolitical risks for carry trade volatility has been significant after 2014. In this country, the historically robust growth path previously achieved by technological advances, improvements in total factor productivity, and exporting activities has been saturated to a lower plateau led by the declining domestic and external demand. As argued by Shahrokhi et al. (2017), while the country was affected to a lower extent from

[11] In the later part of the sample, Russian Ruble has experienced sizeable waves of depreciation, which also coincided with the elevated levels of geopolitical risks. These developments might lead to the spike in the significance of predictive power concerning carry trade returns governed by the relative loss of value in the underlying borrowing currency. On the other hand, predictive power for carry trade volatility (with respect to the Russian market) seems to be stronger for the earlier part of the sample period. This time interval was characterized by stable currency movements but witnessed considerable variation in local interest rates, which is known to influence carry trade return volatility. Consequently, the improvement in the predictive power of risk indicators for the volatility component can be attributed to the course of domestic borrowing costs in Russia at that period.

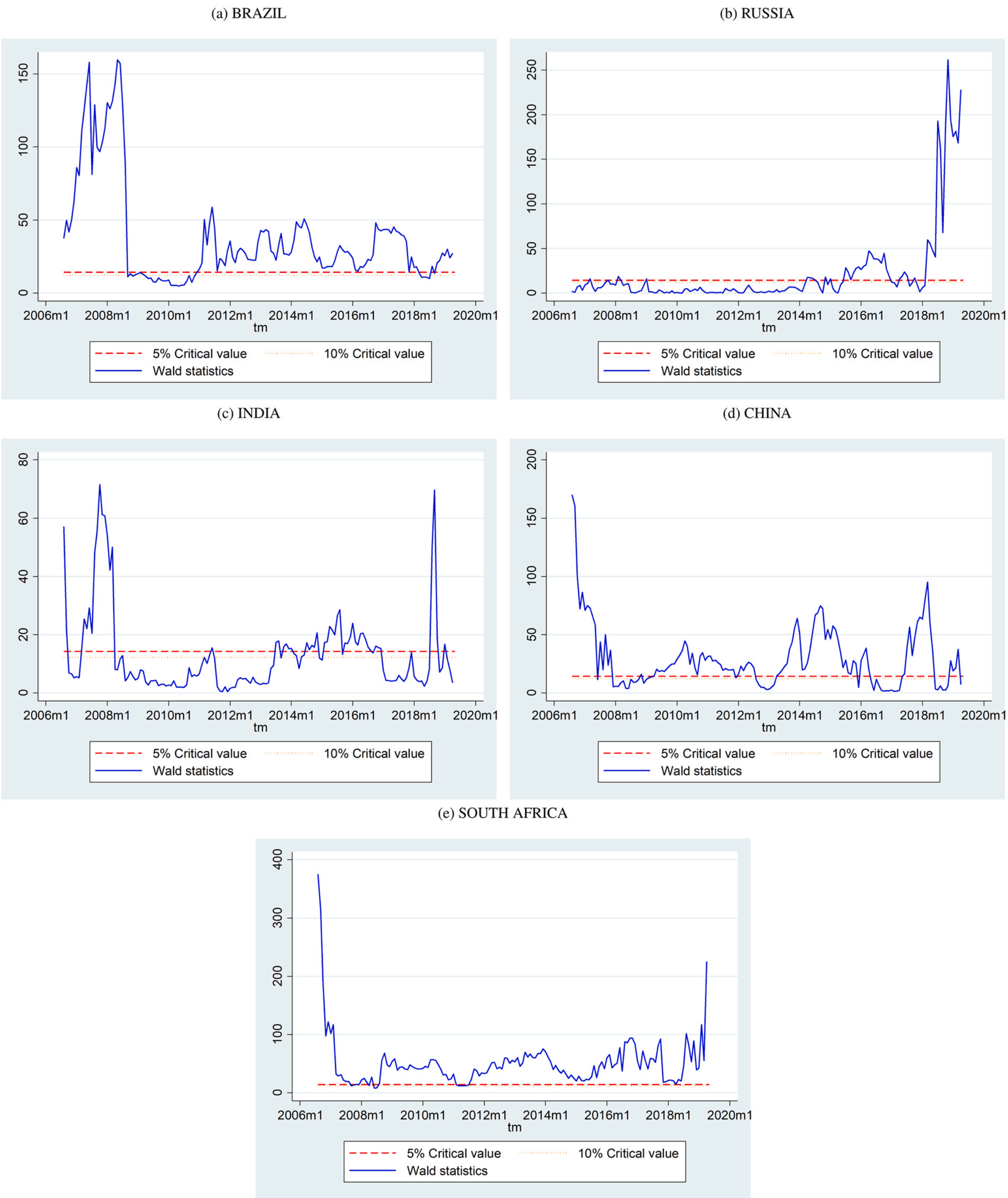

Fig. 2. Time-varying Wald statistics robust Granger-causality tests for carry trade return This figure presents Wald statistics of the Granger-causality robust test assuming heteroscedastic and serially correlated idiosyncratic shocks. The null hypothesis is that geopolitical risk index does not Granger cause corresponding to the carry trade return of the country j where j = Brazil, Russia, India, China, and South Africa.

the Global Financial Crisis, the Indian economy suffers from structural factors limiting the economic prospects and amplifying the sensitivity of macroeconomic/financial performance to geopolitical risks such as inadequacy of institutions, the rise of corruption and dependency on energy imports. Sharma (2012) mentions that India has a relatively inferior record in combating corruption and building up physical and institutional infrastructure. In fact, the post-2014 period coincides with political instability embodying

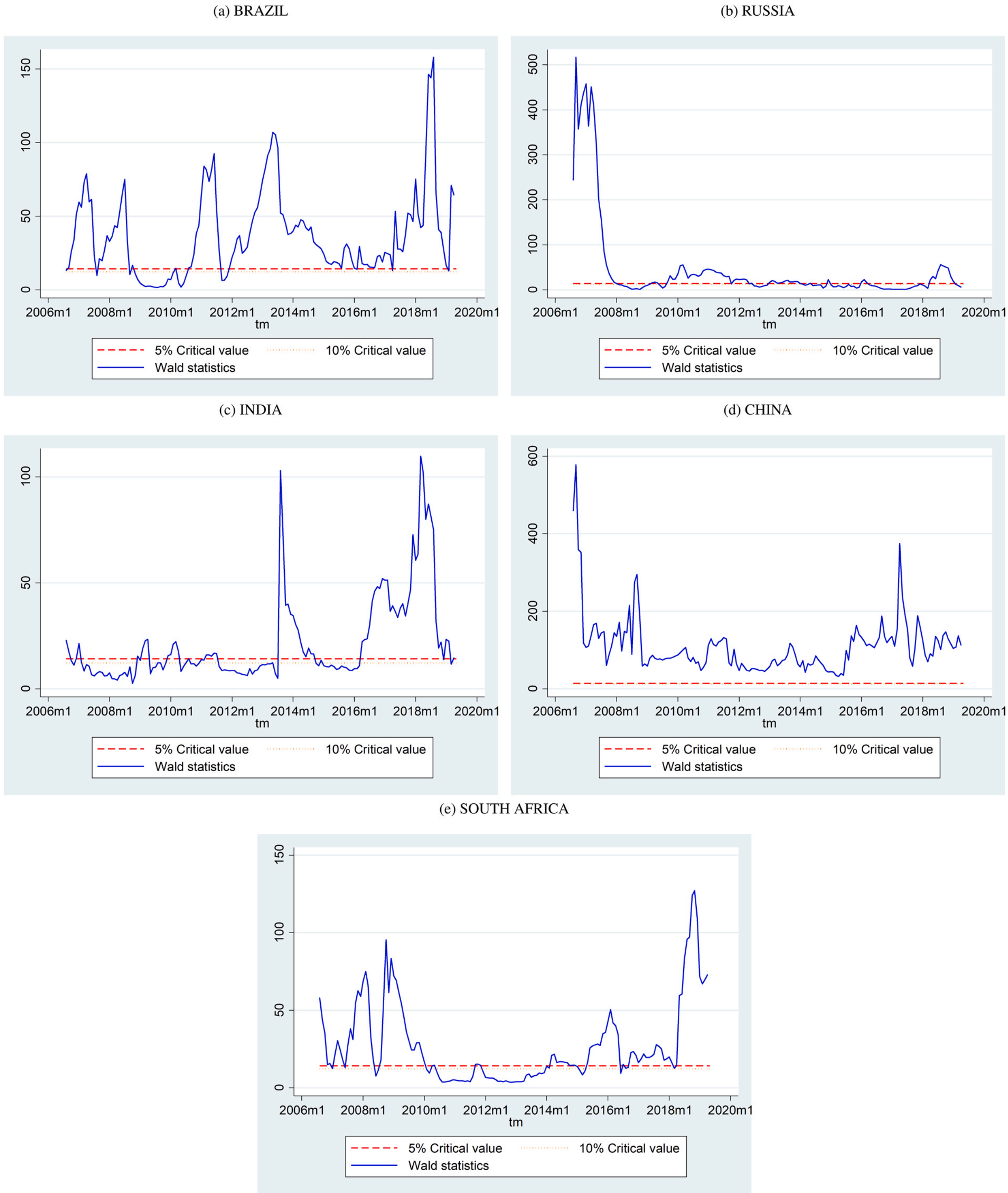

Fig. 3. Time-varying Wald statistics robust Granger-causality tests for carry trade return volatility This figure presents Wald statistics of the Granger-causality robust test assuming heteroscedastic and serially correlated idiosyncratic shocks. The null hypothesis is that geopolitical risk index does not Granger cause corresponding to the carry trade volatility of the country j where j = Brazil, Russia, India, China, and South Africa.

election cycles, corruption allegations against the political elite, civil unrest based on religious motives, violence against minorities, conflicts in Pakistan-India relations. On the financial side, we witness events contributing to the financial risks including the banknote demonetization in 2016, which led to cash shortages and disruption in payment systems, bringing obstacles to economic activity, development and financial inclusion (Mahajan and Singla, 2017, Shirley, 2017, Gana, 2017, Uke, 2017).

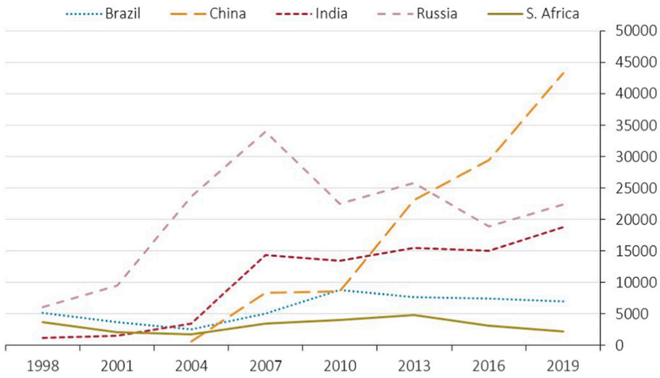

Fig. 4. Spot FX Market Turnover (Daily Average, Million USD).

In the context of China, the course of time-varying Wald statistics is in line with the view that the role of geopolitical risks has been influential over the whole sample period, both for carry trade return and volatility. However, the informative nature of geopolitical events has gained more significance across specific episodes including the Global Financial Crisis and the post-2016 period during which the utilization of protectionist trade measures has been elevated and the downside risk on global trade and supply chains has become visible. With its economic size and export-oriented growth policies, the Chinese economy in the recent decade has been subject to real economic and financial volatilities caused by uncertainties on a local and global scale. Previous studies in the literature highlight the role of uncertainties on the financial outlook in China including corporate investment, household behavior, asset prices, and stock returns (An et al., 2016, Xu et al., 2016, Kang and Ratti, 2015, Liu et al., 2017). Hence, the significant impact of the GPR index on carry trade returns and volatility documented by our estimations is not surprising. Moreover, events like tensions related to Tibet and Xinjiang regions, 2012 political scandal in the Communist Party, mounting conflicts in the East China Sea, Hong-Kong protests, and US-China trade war have all contributed to the prominence of geopolitical risks during our sample period.

Lastly, the course of time-varying Wald statistic for the case of South Africa shows that geopolitical uncertainties stand as a significant determinant of carry trade returns across the whole sample period, whereas the degree of significance is improved recently. The volatility of carry trade returns involving the South African Rand as the target currency is also affected by geopolitical risks in a continuous manner, albeit with brief sub-sample periods with statistical insignificance. Specifically, the high level of external financing obtained from debt instruments issued abroad as well as the relatively larger foreign investor ownership in those securities might make the South African case more susceptible to shifts in global risk aversion (Yildirim, 2016, Demirer et al., 2018). On top of financial drivers, there exist several political events in recent decades including corruption cases, violence against immigrants, and the resignation of President Jacob Zuma supporting the relevance of geopolitical risks in carry trade outcomes.

Regarding the interpretation of our results, one caveat is about the liquidity conditions and the level of development in the FX market of sample countries. Fig. 4 displays BIS data complied under the Triennial Central Bank Survey of Foreign Exchange and Over-the-counter (OTC) Derivatives Markets providing details about the average spot FX market turnover between 1998 and 2019 in three years intervals. Empirical results should be attached more importance over the periods during which spot FX market transactions increased as such trends are also characterized by higher tendencies to engage in carry trade strategies. For instance, results during later phases of the sample period should be emphasized more for China, whereas results around 2007 might be more informative for India and Russia.

6. Conclusion

The carry trade has become one of the most popular trading strategies in the financial markets as investors are actively seeking high yield. A simple carry trade strategy involves buying a currency with a high interest rate and selling a currency with a low interest rate. The returns from the carry trade constitute compensation for exposure to a wide range of risk factors including exchange rate volatility, global risk aversion, and inadequate level of foreign currency reserves. This paper contributes to the prior literature on carry trade returns by showing that geopolitical risks should also be considered as a risk source governing the return structure derived from these transactions. However, global investors tend to under-weigh geopolitical risk largely because these risks are uncertain by definition and are hard to quantify. As a result, investors with well-diversified portfolios might be tempted to ignore geopolitical risks. This is especially valid for the current financial architecture given that investors are diverted towards growth performance and recession risks of domestic markets. We show that the geopolitical risks also matter for active investment strategies incorporating risky assets, such as carry trade strategies.

Considering the occurrence of a wide range of contemporary geopolitical events such as the US-China trade war, Brexit, Syrian war, and Libya tensions, this paper shows that geopolitical risks are correlated with currency carry trade returns. Based on the group of BRICS countries, we show that geopolitical risks Granger cause the carry trade returns when instabilities are accounted for. In contrast, the standard constant parameter Granger causality test finds no evidence of causality between geopolitical risks and carry trade return or volatility except for China. This finding confirms the importance of using the time-varying robust Granger-causality method of Rossi and Wang (2019) which detects the periods when predictive power exists or disappears creating a more appropriate description of the relationship than other traditional time-series methods. Furthermore, the results show that the course and extent of geopolitical risks are also significant pricing factors for carry trade volatility on top of return realizations associated with carry trade strategies.

Our findings point out important differences between return and volatility dynamics regarding their interactions with geopolitical risks. It should be highlighted that pooled panel regressions, which consider sample countries as a bundle of securities in an arbitrary portfolio, indicate that there exists a correlation between geopolitical risks and carry trade volatility, whereas the correlation is found to be weaker for carry trade returns. On the other hand, at a disaggregated level, the time-varying Granger causality tests performed with individual country data hints that the significance of geopolitical risks' predictive power regarding volatility is also heterogeneous across countries, while results mostly converge when the returns are taken as the predicted variable. Prior literature identifies several factors affecting the course of volatility embedded in carry trade strategy including exposure to the stock market and regimes in FX volatility (Christiansen et al., 2011), time-varying autocorrelation in return structure (Daniel et al., 2014), the existence of augmented trading strategies (Jordà, Ò and Taylor, 2012), income risks faced by economic agents (Tessari, 2020), monetary policy and confidence shocks (Anzuini and Fornari, 2012), the divergence between short and long term volatility dynamics (Ahmed and Valente, 2015), and the prevalence of tail risks (Dupuy, 2015). To the extent that these factors are heterogeneous across individual countries, they might accommodate the differing predictive results concerning carry trade volatility captured by the method of time-varying Granger causality.

Overall, the findings of this paper can provide insights into financial market anomalies, and suggest that future research should not neglect information on fundamental geopolitical risks. Our results suggest that exposure to geopolitical risks is one of the main drivers of carry trade return and volatility and should be taken into account when entering carry trade positions in the FX market. Given that geopolitical risks can drive rapid and sharp drawdowns in assets due to their unexpected nature, our results suggest that global investors should investigate the hedging options for FX markets of the BRICS countries, especially during the escalation of geopolitical tensions which is likely to boost investor demand for safe-haven assets.

Appendix A. Appendix

Table A1.

Table A1
Descriptive statistics for carry trade returns and volatilities.

	Brazil_CR	*Russia_CR*	*India_CR*	*China_CR*	*S.Africa_CR*	*Brazil_VOL*	*Russia_VOL*	*India_VOL*	*China_VOL*	*S.Africa_VOL*
Mean	0.28	0.10	0.23	0.12	− 0.04	14.92	11.21	6.48	2.13	16.24
Median	0.85	0.65	0.31	0.15	0.32	13.98	9.23	5.70	1.81	15.08
Std Dev.	3.66	3.80	1.86	0.74	3.65	7.16	9.01	3.04	1.31	6.57
Kurtosis	3.92	5.28	1.19	4.92	3.08	11.14	24.22	8.59	− 0.01	26.31
Skewness	− 1.13	− 1.05	− 0.53	− 0.94	− 0.71	2.57	3.97	2.12	0.79	3.97
Minimum	− 18.61	− 18.82	− 5.98	− 3.54	− 18.15	4.21	2.25	2.56	0.19	8.12
Maximum	9.09	14.29	4.68	2.71	10.94	57.19	80.29	25.48	5.68	68.79

Note: This table presents descriptive statistics for carry trade returns and volatility across our sample countries. We use the following abbreviations; CR: carry trade returns and VOL:volatility. We following the following labeling convention: country name _ variable content.

References

Ahmed, S., Valente, G., 2015. Understanding the price of volatility risk in carry trades. J. Bank. Financ. 57, 118–129.
Akindinova, N., Chernyavskiy, A., Kondrashov, N., Yakovlev, A., 2017. Political response to the crisis: the case of Russia. Economics of European Crises and Emerging Markets. Palgrave, Singapore, pp. 239–262 (pp).
An, H., Chen, Y., Luo, D., Zhang, T., 2016. Political uncertainty and corporate investment: evidence from China. J. Corp. Financ. 36, 174–189.
Andersen, T.G., Bollerslev, T., 1998. Answering the skeptics: yes, standard volatility models do provide accurate forecasts. Int. Econ. Rev. 39 (4), 885–905.
Anzuini, A., Fornari, F., 2012. Macroeconomic determinants of carry trade activity. Rev. Int. Econ. 20 (3), 468–488.
Apergis, N., Bonato, M., Gupta, R., Kyei, C., 2017. Does geopolitical risks predict stock returns and volatility of leading defense companies? Evidence from a non-parametric approach. Def. Peace Econ. 29 (6), 684–696.
Bacchetta, P., van Wincoop, E., 2010. Infrequent portfolio decisions: a solution to the forward discount puzzle. Am. Econ. Rev. 100, 870–904.
Bakshi, G., Panayotov, G., 2013. Predictability of currency carry trades and asset pricing implications. J. Financ. Econ. 110, 139–163.
Balcilar, M., Gupta, R., Pierdzioch, C., Wohar, M.E., 2016. Terror attacks and stock-market fluctuations: Evidence based on a non-parametric causality-in-quantiles test for the G7 countries. Eur. J. Financ. 24 (4), 333–346.
Balcilar, M., Gupta, R., Pierdzioch, C., Wohar, M.E., 2017. Do terror attacks affect the dollar-pound exchange rate? A non-parametric causality-in-quantiles analysis. North Am. J. Econ. Financ. 41 (1), 44–56.
Balcilar, M., Bonato, M., Demirer, R., Gupta, R., 2018. Geopolitical risks and stock market dynamics of the BRICS. Econ. Syst. 42 (2), 295–306.
Balcilar, M., Berisha, E., Gupta, R., Pierdzioch, C., 2021. Time-varying evidence of predictability of financial stress in the United States over a century: the role of inequality. Struct. Change Econ. Dyn. 57, 87–92.
Benedictow, A., Fædtoft, D., Løfsnæs, O., 2013. Oil dependency of the Russian economy: an econometric analysis. Econ. Model. 32, 400–428.
Berg, K.A., Mark, N.C., 2018. Measures of global uncertainty and carry-trade excess returns. J. Int. Money Financ. 88, 212–227.
Berisha, E., Gabauer, D., Gupta, R., Lau, C.K.M., 2020. Time-varying influence of household debt on inequality in United Kingdom. Empir. Econ. 1–17.
Bhansali, V., 2007. Volatility and the carry trade. J. Fixed Income 17 (3), 72–84.

Bilson, J., 1981. The ‘speculative efficiency’ hypothesis. J. Bus. 54, 435–452.
BIS, ,2019. Foreign Exchange and Derivatives Market Activity in 2019. Bank for International Settlements (Triennial Central Bank Survey).
Bonomo, M., Brito, R.D., Martins, B., 2015. The after crisis government-driven credit expansion in Brazil: a firm level analysis. J. Int. Money Financ. 55, 111–134.
Bouras, C., Christou, C., Gupta, R., Suleman, T., 2018. Geopolitical risks, returns, and volatility in emerging stock markets: evidence from a panel GARCH model. Emerg. Mark. Financ. Trade 55 (8), 1841–1856.
Bouri, E., Demirer, R., Gupta, R., Marfatia, H.A., 2018. Geopolitical risks and movements in Islamic bond and equity markets: a note. Def. Peace Econ. 30 (3), 367–379.
Brunnermeier, M.K., Nagel, S., Pedersen, L.H., 2009. Carry trades and currency crashes. NBER Macroecon. Annu. 23, 313–348.
Burnside, C., Eichenbaum, M.S., Kleshchelski, I., and Rebelo, S. , 2006. The returns to currency speculation. NBER Working Paper, No.12489.
Burnside, C., Eichenbaum, M.S., Rebelo, S., 2009. Understanding the forward premium puzzle: a microstructure approach. Econ. J.: Macroecon. 1 (2), 127–154.
Burnside, C., Eichenbaum, M.S., Kleshchelski, I., Rebelo, S., 2011. Do peso problems explain the returns to the carry trade? Rev. Financ. Stud. 24, 853–891.
Bussolo, M., de Hoyos, R., Dixon, P., Rimmer, M., Verikios, G., 2014. Brazil and Mexico Facing the 2008-09 Financial Crisis: Still Fragile Or Becoming Stronger? World Bank.
Caldara, D., and Iacoviello, M. , 2018. Measuring geopolitical risk. FRB International FinanceDiscussion Paper, No.1222.
Cenedese, G., Sarno, L., Tsiakas, I., 2014. Foreign exchange risk and the predictability of carry trade returns. J. Bank. Financ. 42, 302–313.
Cepni, O., Gabauer, D., Gupta, R., and Ramabulana, K. , 2020. Time-varying spillover of US trade war on the growth of emerging economies. University of Pretoria Department of Economics Working Paper Series, No.202002.
Cepni, O., Gül, S., Hacíhasano\uglu, Y.S., Yílmaz, M.H., 2020. Global uncertainties and portfolio flow dynamics of the BRICS countries. Res. Int. Bus. Financ. 54, 101277.
Christiansen, C., Ranaldo, A., Söderlind, P., 2011. The time-varying systematic risk of carry trade strategies. J. Financ. Quant. Anal. 46, 1107–1125.
Clance, M.W., Gupta, R., Wohar, M.E., 2019. Geopolitical risks and recessions in a panel of advanced economies: evidence from over a century of data. Appl. Econ. Lett. 26 (16), 1317–1321.
Clarida, R., Davis, J., Pedersen, N., 2009. Currency carry trade regimes: beyond the Fama regression. J. Int. Money Financ. 28, 1375–1389.
Coronado, S., Gupta, R., Nazlioglu, S., Rojas, O., 2021. Time-varying causality between bond and oil markets of the United States: evidence from over one and half centuries of data. Int. J. Financ. Econ. 1–9.
Corte, P.D., Riddiough, S.J., Sarno, L., 2016. Currency premia and global imbalances. Rev. Financ. Stud. 29 (8), 2161–2193.
Daniel, K., Hodrick, R.J., and Lu, Z. , 2014. The carry trade: Risks and drawdowns.NBER Working Paper, No.20433.
Das, S., Kadapakkam, P.R., Tse, Y., 2013. Is carry-trade a viable alternative asset class? J. Int. Financ. Mark., Inst. Money 24, 247–257.
De Carvalho, F.J.C., 2016. Looking into the abyss? Brazil at the mid-2010s. J. Post Keynes. Econ. 39 (1), 93–114.
Demirer, R., Omay, T., Yuksel, A., Yuksel, A., 2018. Global risk aversion and emerging market return comovements. Econ. Lett. 173, 118–121.
Diallo, I., 2014. XTNPTIMEVAR: Stata module to estimate non-parametric time-varying coefficients panel data models with fixed effects.Statistical Software Components S457900, Boston College Department of Economics.
Dobrynskaya, V., 2014. Downside market risk of carry trades. Rev. Financ. 18 (5), 1885–1913.
Dominguez, K.M., Fatum, R., Vacek, P., 2013. Do sales of foreign exchange reserves lead to currency appreciation? J. Money, Credit Bank. 45 (5), 867–890.
Doskov, N., Swinkels, L., 2015. Empirical evidence on the currency carry trade, 1900-2012. J. Int. Money Financ. 51, 370–389.
Doukas, J.A., Zhang, H., 2013. The performance of NDF carry trades. J. Int. Money Financ. 36, 172–190.
Doval, G.P., Actis, E., 2016. The political and economic instability of Dilma Rousseffas second government in Brazil: between impeachment and the pragmatic turn. India Q. 72 (2), 120–131.
Dupuy, P., 2015. The tail risk premia of the carry trades. J. Int. Money Financ. 59, 123–145.
Egbers, T., Swinkels, L., 2015. Can implied volatility predict returns on the currency carry trade? J. Bank. Financ. 59, 14–26.
Fama, E., 1984. Forward and spot exchange rates. J. Monet. Econ. 14, 319–338.
Farhi, E., Gabaix, X., 2016. Rare disasters and exchange rates. Q. J. Econ. 131 (1), 1–52.
Fung, H.G., Tse, Y., Zhou, L., 2013. Are stock markets in Asia related to carry trade? Pac. -Basin Financ. J. 25, 200–216.
Gana, R., 2017. Demonetization: did India face the St. Petersburg paradox and lose? J. Gov. Regul. 6 (4), 30–38.
Gupta, R., Majumdar, A., Pierdzioch, C., Wohar, M.E., 2017. Do terror attacks predict gold returns? Evidence from a quantile-predictive-regression approach. Q. Rev. Econ. Financ. 65 (1), 276–284.
Hansen, L., Hodrick, R., 1980. Forward exchange rates as optimal predictors of future spot rates: an econometric analysis. J. Political Econ. 88 (5), 829–853.
Jordà, Ò., 2005. Estimation and inference of impulse responses by local projections. Am. Econ. Rev. 95 (1), 161–182.
Jordà, Ò., Taylor, A.M., 2012. The carry trade and fundamentals: nothing to fear but FEER itself. J. Int. Econ. 88 (1), 74–90.
Jurek, J.W., 2014. Crash-neutral currency carry trades. J. Financ. Econ. 113, 325–347.
Kang, W., Ratti, R.A., 2015. Oil shocks, policy uncertainty and stock returns in China. Econ. Transit. 23 (4), 657–676.
Koijen, R.S.J., Moskowitz, T.J., Pedersen, L.H., Vrugt, E.B., 2018. Carry. J. Financ. Econ. 127, 197–225.
Kollias, C., Papadamou, S., Stagiannis, A., 2010. Armed conflicts and capital markets: the case of the Israeli military offensive in the Gaza Strip. Def. Peace Econ. 21 (4), 357–365.
Kollias, C., Papadamou, S., Stagiannis, A., 2011a. Terrorism and capital markets: the effects of the Madrid and London bomb attacks. Int. Rev. Econ. Financ. 20 (4), 532–541.
Kollias, C., Papadamou, S., Stagiannis, A., 2011b. Stock markets and terrorist attacks: comparative evidence from a large and a small capitalization market. Eur. J. Political Econ. 27 (S1), 64–77.
Kollias, C., S.Papadamou, S., Arvanitis, V., 2013a. Does terrorism affect the stock-bond covariance? Evidence from European countries. South. Econ. J. 79 (4) 832-548.
Kollias, C., Kyrtsou, C., Papadamou, S., 2013b. The effects of terrorism and war on the oil and prices-stock indices relationship. Energy Econ. 40, 743–752.
Lettau, M., Maggiori, M., Weber, M., 2014. Conditional risk premia in currency markets and other asset classes. J. Financ. Econ. 114 (2), 197–225.
Li, D., Chen, J., Gao, J., 2011. Non-parametric time-varying coefficient panel data models with fixed effects. Econ. J. 14 (3), 387–408.
Liu, L.X., Shu, H., Wei, K.J., 2017. The impacts of political uncertainty on asset prices: evidence from the Bo scandal in China. J. Financ. Econ. 125 (2), 286–310.
Lustig, H., Verdelhan, A., 2007. The cross-section of foreign currency risk premia and US consumption growth risk. Am. Econ. Rev. 97 (1), 89–117.
Lustig, H., Roussanov, N., Verdelhan, A., 2011. Common risk factors in currency markets. Rev. Financ. Stud. 24, 3731–3777.
Lustig, H., Roussanov, N., Verdelhan, A., 2014. Countercyclical currency risk premia. J. Financ. Econ. 111, 527–553.
Mahajan, P., Singla, A., 2017. Effect of demonetization on financial inclusion in India. Int. J. Sci. Technol. Manag. 6 (1), 338–343.
Melvin, M., Taylor, M.P., 2009. The crisis in the foreign exchange market. J. Int. Money Financ. 28, 1317–1330.
Menkhoff, L., Sarno, L., Schmeling, M., Schrimpf, A., 2012. Carry trades and global foreign exchange volatility. J. Financ. 67, 681–718.
Mensi, W., Hammoudeh, S., Nguyen, D.K., Kang, S.H., 2016. Global financial crisis and spillover effects among the US and BRICS stock markets. Int. Rev. Econ. Financ. 42, 257–276.
Mensi, W., Hammoudeh, S., Yoon, S.M., Nguyen, D.K., 2016. Asymmetric linkages between BRICS stock returns and country risk ratings: evidence from dynamic panel threshold models. Rev. Int. Econ. 24 (1), 1–19.
Mesquita, M., Torós, M., 2010. Brazil and the 2008 panic. BIS Pap. 54, 113–120.
Mitra, A., 2015. An ethical analysis of the 2014 FIFA World Cup in Brazil. Law Bus. Rev. Am. 21, 3.
Miyajima, K., Shim, I., 2014. Asset managers in emerging market economies. BIS Q. Rev. 19.
Mueller, P., Stathopoulos, A., Vedolin, A., 2017. International correlation risk. J. Financ. Econ. 126 (2), 270–299.
Neely, C., Weller, P., 2013. Lessons from the evolution of foreign rxchange trading strategies. J. Bank. Financ. 37 (10), 3783–3798.
Neuwirth, R.J., Svetlicinii, A., 2016. The current EU/US-Russia conflict over Ukraine and the WTO: a preliminary note on (trade) restrictive measures. Post-Sov. Aff. 32 (3), 237–271.

Ranaldo, A., Söderlind, P., 2010. Safe haven currencies. Rev. Financ. 14, 385–407.
Rautava, J., 2004. The role of oil prices and the real exchange rate in Russia's economy – a cointegration approach. J. Comp. Econ. 32 (2), 315–327.
Rossi, B., 2005. Optimal tests for nested model selection with underlying parameter instability. Econom. Theory 21 (5), 962–990.
Rossi, B., Wang, Y., 2019. Vector autoregressive-based Granger causality test in the presence of instabilities. Stata J. 19 (4), 883–899.
Shahrokhi, M., Cheng, H., Dandapani, K., Figueiredo, A., Parhizgari, A.M., Shachmurove, Y., 2017. The evolution and future of the BRICS: unbundling politics from economics. Glob. Financ. J. 32, 1–15.
Sharma, R., 2012. Broken BRICS: why the rest stopped rising. Foreign Aff. 91, 2.
Shirley, M.A.J., 2017. Impact of demonetization in India. Int. J. Trend Res. Dev. 17, 20–23.
Sobreira, R., de Paula, L.F., 2010. The 2008 financial crisis and banking behavior in Brazil: the role of the prudential regulation. J. Innov. Econ. Manag. 2, 77–93.
Tessari, C. , 2020. Common idiosyncratic volatility and carry trade returns. Available at SSRN: 〈https://ssrn.com/abstract=3730582〉.
Uke, L., 2017. Demonetization and its effects in India. SSRG Int. J. Econ. Manag. Stud. 4 (2), 18–23.
Veebel, V., Markus, R., 2016. At the dawn of a new era of sanctions: Russian-Ukrainian crisis and sanctions. Orbis 60 (1), 128–139.
Voskoboynikov, I.B., 2017. Sources of long run economic growth in Russia before and after the global financial crisis. Russ. J. Econ. 3 (4), 348–365.
Wang, W., 2015. Impact of western sanctions on Russia in the Ukraine crisis. J. Polit. Law 8 (2), 1.
Xu, N., Chen, Q., Xu, Y., Chan, K.C., 2016. Political uncertainty and cash holdings: evidence from China. J. Corp. Financ. 40, 276–295.
Yildirim, Z., 2016. Global financial conditions and asset markets: evidence from fragile emerging economies. Econ. Model. 57, 208–220.