Historical geopolitical risk and the behaviour of stock returns in advanced economies

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Abstract[6]

In this study, we investigate the impact of global geopolitical risk (GPR) of different forms on the economies of advanced countries (G7 and Switzerland). We construct a predictive model, following the approach of Lewellen (2004) and Westerlund and Narayan (2012, 2015), to analyze over a century of geopolitical risk indices and stock returns. For robustness, we control for oil price given its strong connection with stock returns of advanced economies and further extend our analysis to out-of-sample predictability. Our findings reveal that GPR is a significant predictor of stock returns in advanced economies although their stock markets are vulnerable to GPR and particularly suffer greater adverse effects from threats of geopolitical risk (such as threats of war and terrorism) than their actual occurrence. Meanwhile, our forecast evaluation results show that the predictive model that accommodates the GPR indices outperforms the benchmark model that ignores the same both in the in-sample and out-of-sample forecast estimates.

Keywords: Geopolitical risk; Stock returns; Advanced equity markets; Predictability; Forecast evaluation

JEL codes: C53; G12; G17; Q02

1. Introduction

In this study, we aim to investigate the impact of global geopolitical risk (GPR) on the economies of advanced countries (G7 and Switzerland). Our choice of advanced economies is based on several reasons. One, these economies represent the most industrialized, export-diversified and

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financially integrated economies of the world with the highest GDP per capita of about $25,000 and contributing over 40% of total global output (in PPP terms). Therefore, any shock to them would have a significant impact on the global economy likewise any threat to the global economy would have greater impacts on them (Liberto, 2021).[7] Consequently, terrorists and other agitators have always chosen to attack these economies to stamp their international influence and recognition. Similarly, there have been increased political tensions among these top economies in recent times.[8] Moreover, the inclusion of Switzerland[9] is deliberate, given the influence it wields among the economies of interest.

Two, a widely held view in the literature is that emerging markets are highly exposed to global and geopolitical risk than developed economies and therefore studies have focused more on the former than the latter (Hoque and Zaidi, 2020). However, globalization and interdependencies among economies have equally made the study of GPR - stock return nexus in the advanced economies crucial particularly for investment and policy decisions since information about systematic risks, of which geopolitical risk is a candidate, is a major requirement in the valuation of stocks (Caldara and Iacoviello, 2019). Three, the recent outbreak of COVID-19 pandemic which has had a disproportionate effect on the global economy makes it even more necessary to conduct a study of this nature (see Salisu and Vo, 2020). Meanwhile, studies have shown that news regarding geopolitical tension do not affect market return dynamics uniformly, hence the need for market-specific analyses (Ramiah and Graham, 2013; Balcilar et al., 2018; Redl, 2018; Hoque and Zaidi, 2020).

Generally, a number of studies have provided in-sample estimates about the significant impact of GPR on financial markets but with limited information about its out-of-sample predictability. A study by Elsayed and Helmi (2021) shows that while GPR does not contribute to the return spillovers among the Middle East and North African (MENA) countries, it does contribute to the responsiveness of the total spillover index to major political events in the region.

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[7] https://www.investopedia.com/terms/a/advanced-economies.asp

[8] These events range from the great decoupling of the US-China tech sector, the strife for a more independent Europe, Politics and Economics of climate change, among others. All these events are capable of creating a deepening business, economic, and cultural divide that can make risks become lasting, casting a deep geopolitical instability over the global space.

[9] For instance, The United States remains a major partner of Switzerland in the area of bilateral trade relations which are highly diverse and have a long history (see https://www.eda.admin.ch/eda/en/home/ representations-and-travel-advice/usa/switzerland-usa.html). Similarly, without being a member of the European Union – which has three of the G-7 countries (France, Germany and Italy) as its members - Switzerland has adopted various provisions of EU laws in order to participate in the union’s single market.

In addition, major economies such as Saudi Arabia, Qatar and United Arab Emirate in the region are observed to be responsible for the transmission of return spillovers to the rest of the MENA markets. This suggests the influence of big economies in transmitting shocks to others. The study of Alqahtani et al. (2021) equally attests to these findings as it finds that the nexus between the stock returns of the Gulf Cooperation Council (GCC) countries and the Saudi's geopolitical risk is consistently negative, indicating that Saudi Arabian geopolitical risk negatively affects the GCC stock markets. In terms of the predictability prowess of GPR for stock returns in the GCC countries, Alqahtani et al. (2020) find that the global geopolitical risk index provides superior predictability in the context of Kuwaiti and Omani stock markets. Furthermore, studying the effect of GPR on crypto currencies, Bouri et al. (2019) present a case for Bitcoin as a good hedge against geopolitical risk. In sum, geopolitical risks have been observed to impact stock returns and volatility (Chen and Siems, 2004; Brounen and Derwall, 2010; Chesney et al., 2011; Balcilar et al., 2018; Yang et al., 2021), reduce economic activity (Cheng and Chiu, 2018), affect Bitcoin price volatility and returns (Aysan et al., 2019), impact exchange rates (Balcilar et al., 2017), gold volatility (Gkillas et al., 2018), and crude oil returns and volatility (Antonakakis et al., 2017). However, despite the numerous studies conducted on this subject, we find a dearth of knowledge on the out-of-sample predictability of GPR for stock returns as virtually all the known studies are limited to in-sample predictability which may not translate into improved out-of-sample forecast gains (Rapach and Zhou, 2013). This is the motivation for our study while at the same time we examine the vulnerability of each of the advanced economies to GPR using long range (historical) data and therefore we are able to trace several episodes of GPR with possible implications on the stock markets.

Our major attraction is that GPR, a newly developed index by Caldara and Iacoviello (2019), captures various risks resulting from armed conflicts, elections, political upheaval, governmental changes, civil strife, war and terrorism. The GPR is defined as "the risks associated with wars, terrorist acts, and tensions between states that affect the normal and peaceful course of international relations". It provides an understanding on the impact of global geopolitical risk on different economic and financial indicators such as stock market, oil market and economic performance. The authors further disaggregated the index into sub- indexes – geopolitical acts (GPRA) and geopolitical threats (GPRT) - to separate the effect of the shocks on the economy and find that shocks due to GPRT often lead to a protracted rise in uncertainty and induce a persistent decline in real activity than the GPRA, among other things. In an earlier study, Caldara and Iacoviello (2018) show that higher geopolitical risks cause a decline in stock returns, suggesting the negative impacts of geopolitical risk on stock returns. It can therefore be inferred that the effect of geopolitical risks on investment decisions and thus the performance of underlying financial assets would be particularly severe in countries where geopolitical tensions are relatively stronger and more persistent (Bouri et al., 2019). Generally, since the September 11, 2001 terrorist attack on the World Trade Centre (WTC), there has been a surge in the number of terror attacks – local and international- recorded in the advanced countries and this has raised the GPR level of those countries.

In theory, geopolitical risks are often considered by policy-makers and investors, as determinants of economic decisions (Balcilar et al., 2018). Hence, one of the channels through which GPR impacts the stock market is highlighted in the pecking order theory of Myers and Majluf (1984). This impact works through the cash holding channel as investors usually delay their investment decisions as a result of panic associated with war, conflict and other components of GPR. Meanwhile, geopolitical risk often prompts flight of capital away from the affected countries, thus forcing the price of stocks and its return to nosedive. Caldara and Iacoviello (2019) put the foregoing in perspective as they confirm that capital moves from region of higher geopolitical risk to region of lower geopolitical risk. This is because, in periods of high GPR, investors direct their savings from more exposed countries to less exposed countries. GPR can also impact the stock market through investment channel, among others (Gkillas et al., 2018) where the risk factor reduces the ease of doing business and transactions, thus, causing a decline in investment, and by extension, a fall in stock return. Similarly, the nexus between GPR and stock returns is well captured in the Arbitrage Pricing Theory (APT). It explains the relationship between risk and expected return by using multiple factors instead of the single market index. Although, there are a number of other theories modelled along this relationship, the APT provides the most accurate prediction of stock returns (see Kisman and Restiyanita, 2015). Within this context, it is believed that episodes of GPR would have impacted the economies of advanced countries in the course of history.

From a methodological point of view, we are conscious of the underlying features of long-range data used in this paper and therefore adopt a technique proposed by Westerlund and Narayan (2012, 2015) that accommodates such features ranging from persistence, conditional heteroscedasticity to endogeneity bias. The evidence in the literature favours the use of this approach for the return predictability of stock markets as well as the other financial assets and commodity markets (see for example, Bannigidadmath and Narayan 2015; Narayan and Bannigidadmath, 2015; Narayan and Gupta, 2015; Phan et al., 2015; Devpura et al., 2018; Salisu et al., 2019a, 2019b).

Our findings show that GPR is a significant predictor of stock returns in most of the advanced economies and the stock markets of these countries are also vulnerable to GPR. In essence, this result implies that higher geopolitical risks depress the stock market, which is consistent with our hypothesis. Probing further, our result reveals that the stock markets suffer greater impacts from geopolitical risk threats (such as threats of war and terrorism) than their actual occurrence. This is not unexpected, as the impact of news on macroeconomic variables is well rooted in economic theory. We find this pattern of thinking in several studies, most recent among them is the construction of the global fear index (Salisu and Akanni, 2020) and uncertainty policy index (Baker et al., 2016) among others. Finally, the in-sample and out-of-sample forecast outcomes confirm that our models outperform the benchmark model.

The remainder of the paper is structured as follows. Section 2 describes the data and methodology. Section 3 presents the results and discussion. Finally, Section 4 contains some concluding comments and policy implications.

2. Data and Methodology

2.1 Data and Preliminary analyses

Our data set consists of historical stock indexes covering over a century of monthly stock price data for eight advanced economies comprising the G7 economies and Switzerland. The specific stock indexes are described as S&P TSX 300 Composite Index (for Canada), CAC All-Tradable Index (for France), CDAX Composite Index (for Germany), Banca Commerciale Italiana Index (for Italy), Nikkei 225 Index (for Japan), All Share Stock Index (for Switzerland), the FTSE All Share Index (for UK), and the S&P 500 Index (for US).[10] The data on the indices and oil price (using the West Texas Intermediate (WTI) crude oil price) are derived from the Global Financial Data[11]. The monthly data on geopolitical risk index is obtained from

[10] https://globalfinancialdata.com/.
[11] This source is considered as it provides a long range of data covering centuries for all the economies considered.

www.matteoiacoviello.com/gpr.htm[12]. The historical geopolitical risk index developed by Caldara and Iocoviello (2019) seeks to measure in real time, geopolitical risk as perceived by the press, the public, global investors and policy makers. They rely on newspaper records to construct daily and monthly geopolitical risks (GPR). This index focuses on geopolitical events in which power struggle over territories cannot be resolved peacefully. It captures both the risk that these events materialize, and the new risk associated with escalation of new events. The GPR index is constructed with an algorithm that counts the frequency of articles related to geopolitical risks in three leading newspapers published in the United States, the United Kingdom and Canada. These newspapers are, the New York Times, the Financial Times, and the Wall Street Journal. However, this count involves searches that identify articles containing references to six groups of words: Group 1 includes words associated with explicit mention of geopolitical risk, as well as other related words involving military-related tensions across large regions of the world including the US. Group 2 includes words directly related to nuclear tensions, Groups 3 and 4 capture words related to war threats and terrorist threats, respectively while Groups 5 and 6 involve press coverage of actual adverse geopolitical events such as terrorist acts or the beginning of a war. Consequently, to address the concerns of whether the economic effects of higher geopolitical risks are due to heightened threat of adverse events or their realization, the developers decomposed the GPR into two sub-indexes – the geopolitical threat (GPRT) and geopolitical acts (GPRA). The GPRT consists of words belonging to Groups 1 to 4 while the GPRA includes words in Groups 5 and 6 only. However, in their study, Caldara and Iocoviello (2019) find that the realization of adverse political events accounted for by GPRA often leads to resolution of uncertainty and thereby having minimal economic impacts, whereas heightened threats of adverse events captured by GPRT lead to a protracted rise in uncertainty that forces economic activities to persistently decline. In essence, economic activities suffer more from the effect of GPRT than GPRA. Therefore, we utilize both the composite historical GPR and the two decomposed sub-indexes, GPRA and GPRT.

Table 1 illustrates the descriptive analysis of countries' stock returns and evaluates its relationship with the composite GPR index and its decomposed form (GPRT and GPRA). The table summarizes the mean, standard deviation, maximum and minimum values of GPR

[12] For a detailed explanation regarding the constituents and index construction methodology, the readers are requested to refer to Caldara and Iacoviello (2019).

(composite and decomposed) and stock returns across all the countries as well as the behavior of stock returns when GPR index increases or declines along its mean value. The reported values in Panel A of Table 1 represent the average stock returns across all the countries at the average GPR index over the period under consideration. However, Panel B reports average country stock returns and its standard deviation when the GPR index is above and below its average value.

It is evident from the table that all the countries, on the average, record positive historical stock returns barring Switzerland. Although the GPR index is high for all the economies considered, it is however remarkably high for the GPRA variant across all the countries. This is indicative that there have been more deadly attacks than there have been threats of attack. Historically, Italy has the highest average stock returns, followed by Japan then France while UK records the lowest stock returns of the G7 countries, followed by US. We also observe that in line with our hypothesis; that an increased GPR index results in less stock returns, only the GPRT impacts stock returns in like fashion. Implying that market responds more to threats than acts of geopolitical risk as espoused in Caldara and Iocoviello (2019). The maximum and minimum values also show that Germany records both the highest and lowest historical stock return values respectively. Rightly so, given the political and economic challenges the country (Germany) faced since the first and second World War and their eventual resurgence in the last decades as a major economic power in Europe and the world. A cursory look at maximum and minimum values recorded by other advanced economies and Switzerland reveals a clustering around a point which explains the sustained steady growth they have all enjoyed across history.

Meanwhile, the result of our scenario analysis shows that when GPRT increases by 10%, stock returns fall for all the countries but when it decreases by the same value, returns rise (see Table 1). Similar result is obtained for GPRA except for countries like France, Italy and UK where the reverse is the case. Overall, increases in GPR are expected to depress the stock markets of advanced economies. These findings have vast implications for the global economy. One, it implies that advanced economies are not insulated from the shocks of geopolitical risk as previously assumed. Two, investors need to pay attention to the acts of geopolitical risk and even more attention to geopolitical threats before investing in the market. Three, it implies that countries with minimal cases of geopolitical threats are more likely to offer greater returns on investment than others.

2.2 Methodology

In this section, we formulate an empirical model that allows us to examine the sensitivity of advanced economies' financial markets to geopolitical risks. The empirical model hinges on the Arbitrage Pricing Theory where stock returns are assumed to respond to systematic or market risks in which the geopolitical risk is a notable candidate. Our formulation is based on the hypothesis that investment in stock market is expected to decrease in value during times of high geopolitical risks (GPR). Technically, we expect a negative relationship between a measure of GPR and returns on investment in the stock market. In essence, as global GPR rises, investors are expected to look elsewhere with less risk for investment and if truly, advanced economies are vulnerable, stock returns should respond negatively to increased GPR values. The model is specified in such way as to control for endogeneity bias (that may result from omitting other predictors of stock returns), conditional heteroscedasticity effect and persistence (which is typical of most financial and economic time series) (see Westerlund and Narayan, 2012, 2015). For easy reference to the result tables, we begin our model specification with the historical average (constant return) model which ignores any potential predictor of stock returns and is specified as:[13]

$$r_{it} = \alpha + e_{it};\ t = 1,2,3,...,T;\ i = 1,2,3,...,N \tag{1}$$

where r_{it} denotes stock returns computed as log returns; α is a constant parameter; and e_{it} is the error term. We extend equation (1) to separately capture the GPR indexes as given below:

$$r_t = \alpha + \lambda^{adj} gprproxy_{t-1} + \gamma\left(gprproxy_t - \rho gprproxy_{t-1}\right) + \eta_t \tag{2}$$

where $gprproxy$ is a proxy for each of the GPR variants - the (composite) GPR and the decomposed indexes, the GPR Threat (GPRT) and the GPR Acts (GPRA) whose equations are distinctly specified in (2a), (2b) and (2c) respectively:

$$r_t = \alpha_1 + \lambda_1^{adj} GPR_{t-1} + \gamma_1\left(GPR_t - \rho_1 GPR_{t-1}\right) + \eta_{1t} \tag{2a}$$

$$r_t = \alpha_2 + \lambda_2^{adj} GPRT_{t-1} + \gamma_2\left(GPRT_t - \rho_2 GPRT_{t-1}\right) + \eta_{2t} \tag{2b}$$

$$r_t = \alpha_3 + \lambda_3^{adj} GPRA_{t-1} + \gamma_3\left(GPRA_t - \rho_3 GPRA_{t-1}\right) + \eta_{3t} \tag{2c}$$

[13] The use of historical average as the baseline model when dealing stock return predictability is standard in the literature since this model is an equivalent version of a random walk model for logged stock prices (see Bannigidadmath & Narayan, 2015; Narayan & Gupta, 2015; Phan et al., 2015; Devpura et al., 2018; Salisu et al., 2019a,2019b; Salisu and Akanni, 2020).

where r_t is the log return of stock price; GPR_t, $GPRT_t$ and $GPRA_t$ respectively denote the composite GPR, the GPR Threats and the GPR Acts, all expressed in natural logs; α is the constant parameter; η_t is the zero mean idiosyncratic error term; and the coefficient λ^{adj} measures the relative impact of geopolitical risk on stock returns. Note that the original specification for equation (2) and by extension equations (2a), (2b) and (2c) is given as $r_t = \alpha + \lambda gprproxy_{t-1} + \varepsilon_t$. However, to resolve any probable endogeneity bias resulting from the correlation between $gprproxy_t$ and ε_t as well as any potential persistence effect, we follow the approach of Lewellen (2004) and Westerlund and Narayan (2012, 2015). Thus, the parameter λ^{adj} is derived as $\lambda^{adj} = \lambda - \gamma(1-\rho)$ (where ρ measures the degree of persistence in $gprproxy_t$) and is described as the bias-adjusted OLS estimator of Lewellen (2004) which corrects for any persistence effect in the predictive model. The additional term $\gamma(gprproxy_t - \rho gprproxy_{t-1})$ corrects for any endogeneity bias resulting from the correlation between $gprproxy_t$ and ε_t as well as any inherent unit root problem in the predictor series. Accounting for endogeneity bias here is important since there could be several determinants of stock returns which are suppressed in equations (2a), (2b) and (2c). Such omissions could introduce endogeneity bias resulting from probable correlations between $gprproxy_t$ and ε_t . To resolve the conditional heteroscedasticity effect, Westerlund and Narayan (2012, 2015) suggest pre-weighting all the data with $1/\hat{\sigma}_\eta$ and estimating the resulting equation with the Ordinary Least Squares (OLS).[14]

We also account for another important global factor, which is oil price given its strong connection with stock returns relative to other macro factors (see Narayan and Gupta, 2015; Smyth and Narayan, 2018; Salisu et al., 2019a, 2019b, 2020a, among others). On this basis, we extend (2) as:

$$\begin{aligned} r_t = \alpha + \lambda^{adj} gprproxy_{t-1} + \gamma\left(gprproxy_t - \rho gprproxy_{t-1}\right) \\ + \phi^{adj} oilproxy_{t-1} + \varphi\left(oilproxy_t - \rho oilproxy_{t-1}\right) + \eta_t \end{aligned} \qquad (3)$$

[14] See Westerlund and Narayan (2012, 2015) for computational details.

where $oilproxy$ is the oil price proxy expressed in logs, and the West Texas Intermediate (WTI) crude oil price is used as a proxy. Our choice is informed by the availability of a long-range data for WTI crude oil price like other variables of interest. Thus, in addition to oil price being an important predictor of stock returns, it appears to be the most relevant common control variable (to serve as another systematic risk) that satisfies our data requirements of using historical data in this study. Note that equation (3) can be replicated for the GPR variants following the same approach in (2a), (2b) and (2c).

We further test whether the inclusion of the risk index in the valuation of stock returns will produce better forecast accuracy at least relative to the historical average model which is a typical benchmark model for most financial and economic series. Since the two models are nested as the historical average is a restricted version of equation (1), their forecast performance comparison can easily be implemented using the Clark and West (2007) [CW] test.[15] The CW test is used to determine the statistical significance of the difference between the forecast errors of the two nested (restricted and unrestricted) models, with the underlying procedure defined by:

$$\hat{f}_{t+h} = \left(r_{t+h} - \hat{r}_{1t,t+h}\right)^2 - \left[\left(r_{t+h} - \hat{r}_{2t,t+h}\right)^2 - \left(\hat{r}_{1t,t+h} - \hat{r}_{2t,t+h}\right)^2\right] \qquad (4)$$

where h denotes the forecast period; $\left(r_{t+h} - \hat{r}_{1t,t+h}\right)^2$ and $\left(r_{t+h} - \hat{r}_{2t,t+h}\right)^2$ are respectively the squared errors for the restricted and the unrestricted models; and $\left(\hat{r}_{1t,t+h} - \hat{r}_{2t,t+h}\right)^2$ is the adjusted squared error incorporated in the CW test to correct for any noise that may characterize the forecasts of larger models. Note that for the GPR-based models, the sample average of $\hat{f}_{t+h}$ can be expressed as $MSE_1 - (MSE_2 - \text{adj.})$ where $MSE_1 = P^{-1}\sum\left(r_{t+h} - \hat{r}_{1t,t+h}\right)^2$, $MSE_2 = P^{-1}\sum\left(r_{t+h} - \hat{r}_{2t,t+h}\right)^2$, $\text{adj.} = P^{-1}\sum\left(\hat{r}_{1t,t+h} - \hat{r}_{2t,t+h}\right)^2$, and P is the number of forecast periods considered in the computation of the averages. In testing for equality of forecast performance between the restricted (the historical average) and the unrestricted models, the generated $\hat{f}_{t+h}$ series is regressed on a constant term only and using the resulting t-statistic for a zero coefficient to determine significance. We reject the hypothesis of a zero coefficient if this statistic is greater than +1.282 (for a one sided 0.10 test) or +1.645 (for a one sided 0.05 test) (see Clark and West, 2007). The rejection of the null hypothesis

[15] An alternative approach which involves the Diebold & Mariano test is not considered since it is more suitable for non-nested models (see Diebold and Mariano, 1995; Harvey et al., 1997; Clark and McCracken, 2001).

implies the preference for the GPR-based model for stock returns. We also employ the single forecast measure involving the Root Mean Square Forecast Error (RMSFE) to complement the Clark & West test results. We consider three out-of-sample forecast horizons, 6-month, 12-month and 24-month ahead forecast horizons and the recursive approach to forecasting is adopted.

3. Results and discussion

3.1 Predictability result of GPR and stock returns of advanced economies

In this sub-section, we present the predictability result of geopolitical risk (GPR) and stock returns of the advanced economies (G7 and Switzerland). We examine this nexus, especially for stock returns, not only from the predictability perspective but also from the perspective of serving as a potential hedge or otherwise vis-à-vis its tolerance or vulnerability to GPR. An asset is said to have a strong (poor) hedging potential against GPR, for example, if the coefficient on the risk factor is positive (negative) implying that the asset is tolerant (vulnerable) to the risk factor in question. As previously noted, we consider three regressions for our empirical analysis: Model 1 (the benchmark model); Model 2 (a single factor GPR-based model) and Model 3 (a multi-factor GPR-based model that includes a control variable, oil price) but only Models 2 and 3 involve in-sample predictability estimates for GPR. The out-of-sample predictability involves the three models and we compare the performance of Models 2 and 3 with the benchmark model (Model 1) at multiple forecast horizons. We also provide out-of-sample forecast evaluation results for the post Bretton woods period (1980 till 2020) in order to test whether limiting the analysis to more recent dynamics would offer better forecast outcomes than using historical data. In our analysis, we utilize different measures of GPR: the composite GPR and the decomposed GPR (GPRA and GPRT) and we have previously defined what these indexes connote.

In Table 2, we present the in-sample predictability result and examine the sole effect of the predictor (i.e., model without control). Our findings show that GPR is a significant predictor of stock returns in the advanced economies except for Italy given the statistical significance of the predictability coefficient. The outcome for Italy may not be unconnected with the fact that since the WWII (World War II), the country has not been at the centre of any major geopolitical risk, as considered by this index, when compared with other advanced economies. The negative relationship between GPR and stock returns implies that the stock markets of advanced economies are vulnerable to GPR and therefore cannot serve as good hedges against GPR. In other words, higher geopolitical risks lower the stock returns of advanced economies and this outcome further corroborates our scenario analyses in the previous section (see Table 1). Narrowing the results to individual stock markets, we find that the outcome remains the same regardless of the GPR index when the US stock market is considered. This is quite plausible, given that the US has become a primary target of terrorist attacks, both international and domestic, since the attack on the world trade centre (WTC) on September 11, 2001. Investors have become very apprehensive about committing their wealth especially during periods of geopolitical instability. Besides, the rise in terrorist organisations such as Al qaeda, Al-Shabab and ISIS threatening the US and Americas foreign policy especially in the Middle East have also heightened geopolitical tensions. Similar result is observed for Canada, Switzerland and Japan which doesn't come as a surprise given that they are all large trading partners of the US especially Canada. The close geographical proximity between the US and Canada also facilitates the propagation of market shocks from the US to Canada (see also Salisu et al., 2021). Germany, Italy and France who are strong members of the EU although vulnerable to the composite GPR and GPRT, have found a way to mitigate the effect of GPRA despite their proximity to the Middle East and North Africa. Despite Europe having its fair share of geopolitical instability, it has been able to weather through the storm and built a resilient and thriving economy. These 3 countries may have been great beneficiaries of a functioning union, the European Union. Meanwhile, the UK, despite been a historic member of the EU, the result obtainable portrays a different picture. While the stock market is vulnerable to GPRA and composite GPR, it is tolerant to GPRT. This implies that threats of war and violence seem to have little damage to the county's stock market. This finding for the UK agrees with the old idea attributed to the London financier, Nathan Rothschild, that one should buy stocks "on cannons" and sell them "on trumpets".

Overall, our results are corroborated by the study of Chesney et al. (2011) where 25 countries that have suffered about 77 terrorist attacks are examined and found to have a negative correlation between these attacks and stock returns. Although, unlike our study, they employ a non-parametric approach and neither use the GPR index nor focus on advanced economies and the analysis is limited to in-sample predictability. Similar result is reported by Zhou et al (2020a, 2020b) while examining the impact of GPR on private credits. Meanwhile, this position departs from some recent findings like those in Elsayed and Helmi (2021) which report a weak or no correlation between GPR index and individual stock returns among countries in the MENA (Middle East and

North Africa) region. The study also reports that GPR index is not a key net transmitter of spillovers to financial market in the region.

Probing further, our result reveals that, on the average, the stock market suffers more from geopolitical risk threats (such as threats of war and terrorism) than their realization. This result corroborates the findings of Caldara and Iacoviello (2019). They examine the responses of activities, trade and stock market in the US to shocks due to GPRA and GPRT and find the shock to the latter to result in a small and short-lived decline in stock returns as the stock market rises sharply one month after the shock. Meanwhile, a shock to the GPRT induces large and protracted recessionary effects, as well as a decline in stock prices.

We also evaluate the forecast prowess of the predictor (GPR) and therefore we partition the data sample into in-sample and out-of-sample periods using the 75:25 data split respectively. The results of the in-sample and out-of-sample forecast evaluations are presented in Table 3 for the former and Tables 4, 5 and 6 for the latter respectively covering 6 months, 12 months and 24 months forecast horizons. The forecast evaluations are based on the Clark and West (2007) test and the decision rule is that a positive and significant value of the parameter estimate in the test equation shows that the GPR-based model (say, Model 2 – the model with geopolitical risk indices as the predictor) outperforms the benchmark model (i.e. Model 1 – the historical average model), otherwise, the benchmark model is superior. We find superior performance of the predictive model that accounts for any of the GPR variants over the benchmark model regardless of the forecast horizon. While investors and portfolio managers may have other considerations when making investment decisions, the inclusion of GPR in this process is important for superior outcomes. A closer look at the individual forecast results for the GPR indexes, shows greater forecast performance of GPRA over GPRT judging by both the test statistics of Clark and West (2007) [CW] in Tables 3, 4, 5 and 6 (as previously described for this test) and the root mean square forecast error (RMSFE) in Table 7 (for the in-sample) and Tables 8, 9 and 10 (for the out-of-sample) over the 6 months, 12 months and 24 months forecast horizons. Consistently, the CW test statistics are larger and the RMSFE statistics are lower for GPRA than GPRT as well as GPR.

3.2 Additional results with an extended model

We extend our analysis further by introducing a control variable (in this case oil) into our model, as captured by Model 3 (with control), in order to examine the sensitivity of the model to additional predictors. Our motivation here is derived from the evidence in the literature (see Narayan and Gupta, 2015; Salisu and Isah, 2017; Smyth and Narayan, 2018; Salisu et al., 2019a, 2019b, among others) suggesting a strong connection between oil and stock both for the in-sample and out-of-sample forecasts. The results are presented in Table 2 although only those of the GPR variants are presented since our interest here is to examine the robustness of the sign and significance of these variants in the face of the additional information. The outcome remains the same even after accounting for oil price indicating the robustness of the predictive model to additional predictors. Moreover, we find higher out-of-sample forecast gains for France, Germany, Switzerland and US for the extended model while the inclusion of the additional predictor does not seem to offer improved forecast gains over the single-factor GPR-based model.

3.3 Additional results with a shorter sample

We also extend the robustness test to check whether using a shorter sample will have implications for the forecast prowess of the predictive model. Thus, rather than forecasting with the historical data covering centuries, we limit the analysis to the post Bretton woods era where the global financial markets particularly those of the advanced economies became more liberalized. In addition, the consideration of a shorter sample helps to assess the time varying properties of the forecast estimates. For want of space, we focus on the out-of-sample forecast estimates as made available in the appendix section (see Tables A, B and C), while other relevant results are available upon request. Summarily, the sub-period analysis is consistent with the full period analysis and helps to put to rest the concern of information loss or time varying behaviour in our variables. In other words, whether using historical or shorter samples (although, one would expect the short sample to be long enough to capture the prominent GPR-related cases), the role of GPR variants in the predictability of stock returns is crucial for improved forecast accuracy. The short sample used here covers several prominent GPR-related cases that seem to have impacted the global economy such as the Gulf war, September 11 terrorist attack, Arab spring and the rise of ISIS, among others, since the collapse of the Bretton woods system in 1971. Therefore, we are not surprised that the outcome of this sample mirrors that of the historical data. In other words, while several risk factors can be captured in the return predictability of stock market, accounting for the variants of geopolitical risks will further strengthen its forecast accuracy.

Overall, we offer findings with implications for policy makers, academics and investors. Geopolitical risk is one of the sources of global shocks and the ability of the government to mitigate against this risk necessarily requires an in-depth understanding of the vulnerability of the economy in question, to the risk. With the detailed analyses rendered in this study, mitigating against the adverse effect of GPR is inevitable for governments or policy makers aiming at retaining capital in the domestic economy even in the face of increased geopolitical risks. In other words, government has a role to play in terms of reducing investors' anxiety and restoring their confidence when the economy is confronted with geopolitical crises (see Su, Yip and Wong, 2002). For instance, government can reverse the downward trend in the stock market during the period of high uncertainty orchestrated by GPR through buying stocks and thereby stabilizing the market. Similarly, during periods of heightened geopolitical risks, governments can provide additional cash to businesses, as well as direct support for financing investments to sustain market performance. Providing extra funding to firms can assist in mitigating against the negative impact of geopolitical risk on domestic lending, a policy which can also help accelerate market performance (see also, Zhou et al., 2020b).

Also, the business community or investors should be wary of increasing investments in markets that are susceptible to geopolitical risks. Put differently, investors need to consider the risk posed by geopolitical tensions in the pricing of stocks in order to maximize returns notwithstanding the incidence of GPR. To academicians, our study has provided a reasonable basis for extending the GPR-stock nexus to the advanced economies. Therefore, more studies are encouraged in this respect possibly in the area of hedging against GPR as well as exploring mixed data sample (MIDAS) approach where the variables of interest are available at different frequencies.

4. Conclusion

In this study, we investigate the impact of global geopolitical risk (GPR) on the economies of advanced countries (G7 and Switzerland). We formulate an empirical model that allows for the estimation of the vulnerability of advanced economies to GPR and the evaluation of the forecast prowess of this global risk factor. Our formulation is based on the hypothesis that investment in stock market decreases in value during times of high geopolitical risks. For the purpose of analysis, we construct a predictive model, following the approach of Lewellen (2004) and Westerlund and

Narayan (2012, 2015) while our data set consists of historical stock indexes covering over a century of monthly stock data for 8 advanced economies. However, besides the cumulative index for historical geopolitical index (GPR), we consider two other variants, the GPRA and GPRT, of this index. The former accounts for all 'acts' that constitute geopolitical risk such as war, nuclear invasion and terrorism, while the latter represents threats of these acts.

Our findings reveal that GPR is a significant predictor of stock returns in the advanced economies except for Italy. We also show that the stock market suffers greater impacts from threats of geopolitical risks (such as threats of war and terrorism) than their actual occurrence. The advanced stock markets are vulnerable to GPR and therefore cannot serve as good hedges against GPR. This is apparent from the negative sign of the coefficients on GPR variants. We further note models that account for GPR variants outperform the benchmark model for both the in-sample and out-of-sample estimates. An extended model that accounts for another important global factor, oil price, also supports this claim and further asserts the robustness of the GPR-based model to additional predictors.

We believe that financial analyst and policy makers who constantly seek means to provide accurate forecasts of stock returns for investments and policy decisions would find the results useful particularly as regards the role of GPR in the valuation of future stocks. As geopolitical tensions impact negatively on stock markets, mitigating against their adverse effects by policy makers is inevitable in order to prevent capital flight in response to GPR and some of the options highlighted in the preceding section can be considered. Likewise, investors and portfolio managers in these countries can mitigate the impact of GPR either by diversifying their portfolios during episodes of increased geopolitical tensions or by accounting for this risk factor, among others, when pricing or valuing stocks. Finally, an extension of our study that offers more insights into the hedging possibilities during periods of high geopolitical tensions would further complement our findings. Additionally, future studies can explore the mixed data sample (MIDAS) approach rather limiting the empirically analysis to a uniform particularly where the variables of interest are available at different frequencies. Related studies such as Wang et al. (2020) Salisu et al. (2020b), Amendola et al. (2021) and Yu and Huang (2021), among others, can be used to motivate the use of MIDAS approach.

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Table 1: Summary Statistics for stock returns and geopolitical risk index of advanced economies

Panel A: Descriptive statistics

			Canada	**France**	**Germany**	**Italy**	**Japan**	**Switzerland**	**UK**	**US**
Start date			**02/1915**	**01/1899**	**01/1899**	**02/1905**	**08/1914**	**02/1916**	**01/1899**	**01/1899**
End date			**10/2020**	**10/2020**	**10/2020**	**10/2020**	**10/2020**	**10/2020**	**10/2020**	**10/2020**
	Stock	mean	0.3966	0.5280	0.3851	0.6217	0.5810	-0.0544	0.2573	0.3566
		Sd	4.6421	4.7416	8.7565	6.7460	6.7167	4.1560	3.6168	4.4765
		Max	20.5891	24.2548	68.8721	46.8105	50.8718	28.7773	42.3197	40.7459
		Min	-33.4603	-28.1855	-145.9963	-30.7573	-30.7862	-28.2157	-30.9241	-30.7528
		Nobs	1269	1462	1462	1389	1275	1257	1462	1462
	GPR	mean	59.3263	50.6185	50.6185	53.0576	60.4805	56.5671	50.6185	50.6185
		Sd	41.6589	40.7049	40.7049	43.2464	44.4173	34.0545	40.7048	40.7048
		Max	552.6000	618.5330	618.5330	618.5300	618.5300	552.6000	618.5300	618.5300
		Min	12.1400	5.1116	5.1116	5.1100	12.1400	12.1400	5.1100	5.1100
		Nobs	1272	1465	1465	1392	1278	1260	1465	1465
	GPRA	mean	118.0332	117.2356	117.2356	115.1005	123.1347	103.1998	117.2356	117.2356
		Sd	182.8527	176.0024	176.0024	186.7268	197.7623	136.4370	176.0025	176.0025
		Max	2484.2400	2484.2400	2484.2400	2484.2400	2484.2400	2484.2400	2484.2400	2484.2400
		Min	4.5500	0.0000	0.0000	0.0000	4.5500	4.5500	0.0000	0.0000
		Nobs	1272	1465	1465	1392	1278	1260	1465	1465
	GPRT	mean	41.4159	32.1569	32.1569	35.2249	41.6518	41.5845	32.1569	32.1569
		Sd	16.0679	17.5187	17.5187	17.5647	16.1546	16.2517	17.5186	17.5186
		Max	470.1900	470.1944	470.1944	470.1900	470.1900	470.1900	470.1900	470.1900
		Min	1.6400	0.0000	0.0000	0.0000	1.6400	1.6400	0.0000	0.0000
		Nobs	1272	1465	1465	1392	1278	1260	1465	1465
Panel B: Scenario analysis										
GPR	Above	mean	0.2696	0.5558	-0.1593	0.4159	0.4294	0.2696	0.3621	0.3939
		Sd	4.0028	5.5528	5.9829	7.5675	5.0031	4.0028	4.2541	3.8879
	Below	mean	0.4164	0.4598	0.3408	0.3491	0.5626	0.4164	0.2961	0.4330
		Sd	4.6830	4.6291	8.6434	6.3833	6.4775	4.6830	3.8958	4.4483
GPRA	Above	mean	0.1196	1.0010	0.0034	0.9564	0.0863	0.1196	0.2504	0.0920
		Sd	3.5980	5.7603	6.9011	9.0764	5.5144	3.5980	3.4815	3.8753
	Below	mean	0.5014	0.4318	0.2845	0.2826	0.6064	0.5014	0.3543	0.5209

		Sd	4.5952	4.9699	7.6624	6.1604	6.2612	4.5952	4.4125	4.2710
GPRT	Above	mean	0.1019	0.3967	-0.1476	0.0156	0.3434	0.1019	0.1054	0.4375
		Sd	4.5891	5.7295	5.9471	6.6875	5.2754	4.5891	5.1194	4.0584
	Below	mean	0.3966	0.5253	0.4047	0.6121	0.5899	0.3966	0.2223	0.4009
		Sd	4.6421	4.7448	9.1166	6.5926	6.7239	4.6421	3.5134	4.5785

Note: Stock represents stock returns and expressed in percentages, computed as the logarithmic first differences of corresponding stock market index, that is, 100*log (Stock/Stock (-1)), GPR is the composite geopolitical risk, GPRA is geopolitical risk act and GPRT is geopolitical risk threat. Above and Below denotes 10% above and below the mean respectively. Sd represents standard deviation. Mean and Sd is computed for monthly observations of individual series.

Table 2: Predictability result of GPR and stock returns of advanced economies

		Canada	France	Germany	Italy	Japan	Switzerland	UK	US
Without Control	GPR	-0.0149[a]	-0.0020	-0.1372[a]	0.0155	-0.0880[a]	-0.0282[a]	-0.0183[b]	-0.0677[a]
		(0.0031)	(0.0029)	(0.0165)	(0.0093)	(0.0092)	(0.0045)	(0.0087)	(0.0072)
	GPRA	-0.0012[a]	0.0023[a]	0.0062	0.0177[a]	-0.0107[a]	-0.0121[a]	-0.0153[a]	-0.0151[a]
		(0.0011)	(0.0008)	(0.0069)	(0.0027)	(0.0027)	(0.0022)	(0.0029)	(0.0026)
	GPRT	-0.0248[a]	-0.0163[a]	-0.2000[a]	-0.0349[a]	-0.1438[a]	-0.0192[a]	0.0354[a]	-0.0774[a]
		(0.0035)	(0.0040)	(0.0179)	(0.0133)	(0.0121)	(0.0046)	(0.0110)	(0.0091)
With Control	GPR	-0.0147[a]	-0.0019	-0.1257[a]	0.0162[c]	-0.0894[a]	-0.0286[a]	-0.0181[a]	-0.0687[a]
		(0.0031)	(0.0029)	(0.0164)	(0.0093)	(0.0092)	(0.0046)	(0.0087)	(0.0074)
	GPRA	-0.0013[a]	0.0029[a]	0.0045	0.0178[a]	-0.0109[a]	-0.0121[a]	-0.0153[a]	-0.0149[a]
		(0.0011)	(0.0008)	(0.0067)	(0.0026)	(0.0027)	(0.0022)	(0.0029)	(0.0026)
	GPRT	-0.0243[a]	-0.0163[a]	-0.1808[a]	-0.0330	-0.1466[a]	-0.0193[a]	0.0350[a]	-0.0777[a]
		(0.0035)	(0.0040)	(0.0182)	(0.0134)	(0.0121)	(0.0046)	(0.0110)	(0.0094)

Note: "Without Control" implies the original model with the predictor of interest only while "With Control" is an extension of the original model to include relevant control variables. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. Values in parenthesis represents standard error. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act, and GPRT is the geopolitical risk threat.

Table 3: In-sample Forecast Evaluations using the Clark & West test

	Canada		France		Germany		Italy		Japan		Switzerland		Uk		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
In-Sample																
GPR	6.6503^{a}	6.6417^{a}	9.9130^{a}	9.9587^{a}	7.2592	8.9252	20.4607^{b}	20.2069^{b}	24.9727^{a}	24.3051^{a}	6.5695^{a}	7.1126^{a}	3.0155	2.9140	6.7487^{c}	7.0514^{c}
	[2.5478]	[2.5437]	[2.9316]	[2.9475]	[0.3727]	[0.4640]	[1.9414]	[1.9169]	[3.1346]	[3.0342]	[2.2510]	[2.4613]	[0.6843]	[0.6564]	[1.4297]	[1.4913]
GPRA	6.7629^{a}	6.7613^{a}	10.0389^{a}	10.0952^{a}	5.3801	8.2985	20.0485^{b}	19.7336^{b}	26.5810^{a}	26.0285^{a}	5.4959^{b}	6.0333^{a}	4.2854	4.1307	8.6950^{b}	8.9473^{b}
	[2.6130]	[2.6124]	[2.9992]	[3.0195]	[0.3009]	[0.4564]	[1.8970]	[1.8671]	[3.3534]	[3.2523]	[1.8623]	[2.1208]	[0.9946]	[0.9370]	[1.8924]	[1.9476]
GPRT	6.5762^{a}	6.5598^{a}	9.3511^{a}	9.3742^{a}	7.6310	8.8150	21.9188^{a}	21.6679^{a}	28.8200^{a}	28.1117^{a}	6.4113^{a}	7.0444^{a}	3.5229	3.3939	7.1715^{c}	7.4316^{c}
	[2.5239]	[2.5163]	[2.7526]	[2.7607]	[0.3834]	[0.4468]	[2.0755]	[2.0511]	[3.4099]	[3.3283]	[2.2362]	[2.4745]	[0.7498]	[0.7170]	[1.5539]	[1.6044]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control variable. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.

Table 4: Out-of-sample Forecast Evaluations using the Clark & West test

	Canada		France		Germany		Italy		Japan		Switzerland		Uk		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
Out-of-sample, h = 6																
GPR	6.6149^{a}	6.6062^{a}	10.6381^{a}	10.6838^{a}	7.4933	9.1407	20.2305^{b}	20.0043^{b}	24.5628^{a}	23.7730^{a}	6.9217^{a}	7.4536^{a}	3.5181	3.4114	7.1721^{c}	7.4716^{c}
	[2.5444]	[2.5403]	[3.1293]	[3.1452]	[0.3872]	[0.4782]	[1.9300]	[1.9080]	[3.0717]	[2.9583]	[2.3821]	[2.5909]	[0.8012]	[0.7713]	[1.5264]	[1.5875]
GPRA	6.7281^{a}	6.7265^{a}	10.7400^{a}	10.7952^{a}	5.9184	8.6066	19.8030^{b}	19.5179^{b}	26.1919^{a}	25.5350^{a}	5.8202^{b}	6.3349^{a}	4.8710	4.7100	9.1677^{b}	9.4164^{b}
	[2.6102]	[2.6096]	[3.1930]	[3.2131]	[0.3271]	[0.4762]	[1.8844]	[1.8571]	[3.2939]	[3.1823]	[1.9816]	[2.2378]	[1.1337]	[1.0717]	[2.0035]	[2.0582]
GPRT	6.5473^{a}	6.5308^{a}	10.0378^{a}	10.0610^{a}	7.6833	8.8738	21.7249^{a}	21.5052^{a}	28.4103^{a}	27.5677^{a}	6.7442^{a}	7.3678^{a}	4.0619	3.9269	7.5576^{c}	7.8124^{b}
	[2.5231]	[2.5153]	[2.9419]	[2.9500]	[0.3884]	[0.4526]	[2.0686]	[2.0470]	[3.3594]	[3.2629]	[2.3628]	[2.6001]	[0.8666]	[0.8317]	[1.6454]	[1.6947]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control variable and h = 6 represents the month 6 forecast horizon. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.

Table 5: Out-of-sample Forecast Evaluations using the Clark & West test

	Canada		France		Germany		Italy		Japan		Switzerland		Uk		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
Out-of-sample, h = 12																
GPR	6.5627^{a}	6.5548^{a}	10.5939^{a}	10.6416^{a}	7.2720	8.9475	21.3130^{a}	21.1874^{a}	24.5532^{a}	23.8026^{a}	7.2725^{a}	7.8010^{a}	3.7415	3.6529	6.9309^{c}	7.2325^{c}
	[2.5345]	[2.5307]	[3.1212]	[3.1378]	[0.3780]	[0.4709]	[2.0402]	[2.0268]	[3.0863]	[2.9771]	[2.5135]	[2.7233]	[0.8549]	[0.8284]	[1.4819]	[1.5438]
GPRA	6.6688^{a}	6.6674^{a}	10.6974^{a}	10.7556^{a}	6.1463	8.4124	20.7476^{b}	20.5545^{b}	26.1277^{a}	25.5043^{a}	6.1655^{a}	6.6666^{a}	4.9934	4.8587	8.9213^{b}	9.1720^{a}
	[2.5979]	[2.5973]	[3.1857]	[3.2068]	[0.3376]	[0.4683]	[1.9822]	[1.9629]	[3.3027]	[3.1946]	[2.1083]	[2.3653]	[1.1670]	[1.1099]	[1.9581]	[2.0135]
GPRT	6.4973^{a}	6.4823^{a}	10.0114^{a}	10.0361^{a}	7.5562	8.7538	22.6760^{a}	22.5549^{a}	28.4401^{a}	27.6413^{a}	7.0682^{a}	7.6894^{a}	4.4441	4.3330	7.3265^{c}	7.5845^{b}
	[2.5140]	[2.5068]	[2.9380]	[2.9466]	[0.3844]	[0.4493]	[2.1675]	[2.1544]	[3.3817]	[3.2896]	[2.4875]	[2.7257]	[0.9494]	[0.9186]	[1.6028]	[1.6533]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control variable and h = 12 represents the month 12 forecast horizon. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.

Table 6: Out-of-sample Forecast Evaluations using the Clark & West test

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
Out-of-sample, h = 24																
GPR	6.7513^{a}	6.7440^{a}	11.1083^{a}	11.1476^{a}	6.6780	8.4234	25.7769^{a}	26.6380^{a}	23.8079^{a}	22.9649^{a}	7.6962^{a}	8.2155^{a}	4.0148	3.8468	7.1906^{c}	7.4653^{c}
	[2.6348]	[2.6311]	[3.2908]	[3.3059]	[0.3514]	[0.4488]	[2.4676]	[2.5181]	[3.0004]	[2.8805]	[2.6771]	[2.8865]	[0.9153]	[0.8687]	[1.5550]	[1.6121]
GPRA	6.8420^{a}	6.8407^{a}	11.1915^{a}	11.2383^{a}	5.8051	7.9620	24.8464^{a}	25.6475^{a}	25.4474^{a}	24.7473^{a}	6.5927^{a}	7.0699^{a}	5.2915	5.0465	9.3541^{a}	9.5811^{a}
	[2.6939]	[2.6933]	[3.3521]	[3.3712]	[0.3169]	[0.4487]	[2.3787]	[2.4259]	[3.2296]	[3.1132]	[2.2705]	[2.5263]	[1.2360]	[1.1496]	[2.0739]	[2.1252]
GPRT	6.6886^{a}	6.6750^{a}	10.5078^{a}	10.5269^{a}	7.0921	8.3161	27.1053^{a}	28.0516^{a}	27.4696^{a}	26.5684^{a}	7.4563^{a}	8.0687^{a}	5.4407	5.2343	7.5124^{b}	7.7299^{b}
	[2.6152]	[2.6084]	[3.1031]	[3.1107]	[0.3652]	[0.4321]	[2.5917]	[2.6474]	[3.2775]	[3.1731]	[2.6421]	[2.8798]	[1.1180]	[1.0636]	[1.6627]	[1.7051]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control variable and h = 24 represents the month 24 forecast horizon. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.

Table 7: In-sample forecast evaluation RMSFE (In-sample)

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
GPR	9.4313	9.4336	11.2648	11.2582	33.5886	32.4703	23.6840	23.5903	19.2709	19.3767	10.8547	10.7831	17.1665	17.1112	15.7574	15.6976
GPRA	9.3980	9.3977	11.1497	11.1409	35.6876	34.6800	23.8794	23.8008	19.6364	19.7185	10.8296	10.5250	16.2622	16.2157	15.5554	15.4832
GPRT	9.4877	9.4922	4.9293	11.3836	32.8945	31.8462	23.8020	23.7434	19.5576	19.6572	10.8838	10.8436	15.4593	15.4702	15.6522	15.5708

Note: GPR is the composite geopolitical risk, GPRA is geopolitical risk act and GPRT is geopolitical risk threat. RMSFE is the root mean square forecast error; 2 represents Model 2 with GPR as the only predictor and 3 represents Model 3 with GPR and oil as the predictors. The smaller the RMSE value the better the forecast performance of a model.

Table 8: Out-of-sample Forecast evaluation using RMSFE (Out-of-sample, h = 6)

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
GPR	9.4331	9.4355	11.2525	11.2459	33.5552	32.4397	23.6894	23.5971	19.3051	19.4094	10.8443	10.7735	17.1417	17.0859	15.7342	15.6745
GPRA	9.3984	9.3982	11.1372	11.1284	35.6665	34.6552	23.8701	23.7919	19.6641	19.7452	10.8158	10.5123	16.2497	16.2023	15.5470	15.4749
GPRT	9.4881	9.4928	11.2377	11.3692	32.8125	31.7720	23.7952	23.7370	19.5779	19.6761	10.8694	10.8303	15.4723	15.4822	15.6237	15.5421

Note: GPR is the composite geopolitical risk, GPRA is geopolitical risk act and GPRT is geopolitical risk threat. RMSFE is the root mean square forecast error; 2 represents Model 2 with GPR as the only predictor and 3 represents Model 3 with GPR and oil as the predictors. The smaller the RMSE value the better the forecast performance of a model.

Table 9: Out-of-sample Forecast evaluation using RMSFE (Out-of-sample, h = 12)

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
GPR	9.4359	9.4383	11.2577	11.2508	33.5607	32.4395	23.6767	23.5865	19.3094	19.4175	10.8336	10.7626	17.1405	17.0859	15.7409	15.6802
GPRA	9.4003	9.4000	11.1415	11.1324	35.6527	34.6307	23.8406	23.7630	19.6665	19.7505	10.8032	10.4989	16.2489	16.2023	15.5603	15.4871
GPRT	9.4897	9.4944	11.1201	11.3732	32.7757	31.7409	23.7759	23.7188	19.5687	19.6714	10.8544	10.8151	15.5005	15.5127	15.6215	15.5392

Note: GPR is the composite geopolitical risk, GPRA is geopolitical risk act and GPRT is geopolitical risk threat. RMSFE is the root mean square forecast error; 2 represents Model 2 with GPR as the only predictor and 3 represents Model 3 with GPR and oil as the predictors. The smaller the RMSE value the better the forecast performance of a model.

Table 10: Out-of-sample Forecast evaluation using RMSFE (Out-of-sample, h = 24)

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
GPR	9.4236	9.4260	11.2377	11.2290	33.4988	32.3324	23.6071	23.5270	19.3678	19.4777	10.8237	10.7519	17.1511	17.1202	15.6946	15.6236
GPRA	9.3839	9.3837	11.1201	11.1085	35.6190	34.5298	23.7591	23.6892	19.6998	19.7850	10.7888	10.4833	16.2529	16.2394	15.5552	15.4709
GPRT	9.4766	9.4813	11.3459	11.3403	32.6821	31.6237	23.7051	23.6575	19.6266	19.7320	10.8384	10.7986	15.8207	15.8829	15.5623	15.4689

Note: GPR is the composite geopolitical risk, GPRA is geopolitical risk act and GPRT is geopolitical risk threat. RMSFE is the root mean square forecast error; 2 represents Model 2 with GPR as the only predictor and 3 represents Model 3 with GPR and oil as the predictors. The smaller the RMSE value the better the forecast performance of a model.

Appendix

Table A: Out-of-sample Forecast Evaluations using the Clark & West test for a shorter sample

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
Out-of-sample, h = 6																
GPR	8.8569[b]	8.4041[b]	15.5392[a]	17.2439[a]	12.3970[b]	13.6006[a]	28.5672[a]	36.0712[a]	5.9860	6.8687	9.9360[a]	10.6186[a]	11.3822[a]	10.9051[a]	10.2301[a]	11.2670[a]
	[2.3801]	[2.2422]	[2.7874]	[3.1088]	[2.2503]	[2.5023]	[2.7244]	[3.4777]	[1.0511]	[1.2449]	[2.9220]	[3.1353]	[3.2564]	[3.1244]	[4.4252]	[4.7796]
GPRA	9.3674[a]	8.9170[a]	15.2027[a]	16.2861[a]	11.9907[b]	12.6091[b]	27.8325[a]	31.5009[a]	5.9638	5.2051	9.2075[a]	9.5440[a]	11.4952[a]	11.3459[a]	10.5902[a]	11.7100[a]
	[2.5980]	[2.4670]	[2.7410]	[2.9352]	[2.1400]	[2.2592]	[2.6074]	[2.9769]	[1.0407]	[0.9238]	[2.6751]	[2.7605]	[3.3042]	[3.2688]	[4.6736]	[5.0857]
GPRT	8.9074[b]	8.7622[b]	16.5343[a]	18.0160[a]	14.4075[a]	15.1092[a]	29.4692[a]	36.7809[a]	5.0895	5.3211	10.2678[a]	11.0688[a]	11.2626[a]	10.7513[a]	10.7164[a]	11.6559[a]
	[2.4416]	[2.3995]	[2.9952]	[3.2535]	[2.6961]	[2.8420]	[2.7965]	[3.4772]	[0.8790]	[0.9436]	[3.0492]	[3.2824]	[3.2374]	[3.0939]	[4.6788]	[4.9958]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control and h = 6 represents the month 6 forecast horizon. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.

Table B: Out-of-sample Forecast Evaluations using the Clark & West test for a shorter sample

	Canada		France		Germany		Italy		Japan		Switzerland		UK		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
Out-of-sample, h = 12																
GPR	8.4382[b]	7.9966[b]	14.3026[a]	15.9665[a]	11.5339[b]	12.6821[b]	26.3703[a]	33.7972[a]	4.5836	5.5083	9.1203[a]	9.7936[a]	10.7759[a]	10.3183[a]	9.6563[a]	10.6937[a]
	[2.2920]	[2.1564]	[2.5808]	[2.8935]	[2.1034]	[2.3416]	[2.5402]	[3.2895]	[0.8112]	[1.0062]	[2.6996]	[2.9094]	[3.1063]	[2.9791]	[4.1799]	[4.5482]
GPRA	8.9737[a]	8.5342[b]	14.0091[a]	15.0676[a]	11.1728[b]	11.7629[b]	25.7118[b]	29.3585[a]	4.5347	3.8016	8.4332[a]	8.7734[a]	10.9117[a]	10.7680[a]	10.0531[a]	11.1695[a]
	[2.5154]	[2.3857]	[2.5415]	[2.7312]	[2.0050]	[2.1184]	[2.4344]	[2.8031]	[0.7971]	[0.6797]	[2.4684]	[2.5569]	[3.1600]	[3.1256]	[4.4442]	[4.8663]
GPRT	8.5125[b]	8.3735[b]	15.2532[a]	16.7056[a]	13.4864[a]	14.1489[a]	27.2388[a]	34.4934[a]	3.7012	3.9966	9.4506[a]	10.2403[a]	10.6625[a]	10.1692[a]	10.1171[a]	11.0664
	[2.3582]	[2.3173]	[2.7784]	[3.0326]	[2.5329]	[2.6691]	[2.6107]	[3.2934]	[0.6445]	[0.7149]	[2.8250]	[3.0556]	[3.0881]	[2.9487]	[4.4147]	[4.7510]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control and h = 12 represents the month 12 forecast horizon. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.

Table C: Out-of-sample Forecast Evaluations using the Clark & West test (Post Bretton woods)

	Canada		France		Germany		Italy		Japan		Switzerland		Uk		US	
	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3	1 Vs 2	1 Vs 3
Out-of-sample, h = 24																
GPR	6.4364[c]	6.2644[c]	11.3167[b]	12.5328[b]	8.5555	9.2534c	20.7042[b]	27.0069[a]	1.7051	2.5666	7.3042[b]	7.7670[a]	8.9494[a]	8.6071[a]	7.7120[a]	8.2879[a]
	[1.7202]	[1.6770]	[2.0485]	[2.2626]	[1.5619]	[1.6911]	[2.0063]	[2.6200]	[0.2955]	[0.4576]	[2.1780]	[2.3132]	[2.5623]	[2.4784]	[3.1624]	[3.2212]
GPRA	7.0065[b]	6.9146[c]	11.1361[b]	11.8064[b]	8.3933	8.7000	20.2890[b]	22.8092[b]	1.4986	0.9447	6.7197[b]	6.9177[b]	9.0869[a]	8.9877[a]	8.2196[a]	8.8552[a]
	[1.9282]	[1.9197]	[2.0304]	[2.1389]	[1.5162]	[1.5680]	[1.9385]	[2.1785]	[0.2564]	[0.1649]	[1.9877]	[2.0329]	[2.6089]	[2.5902]	[3.4623]	[3.5339]
GPRT	6.5425[c]	6.4908[c]	12.2164[b]	13.2803[b]	10.4191[b]	10.7000[b]	21.5168[b]	27.7225[a]	0.8135	1.0396	7.6524[b]	8.2151[a]	8.8422[a]	8.4672[a]	8.1323[a]	8.6052[a]
	[1.7823]	[1.7713]	[2.2297]	[2.4026]	[1.9525]	[1.9944]	[2.0746]	[2.6430]	[0.1389]	[0.1817]	[2.3050]	[2.4581]	[2.5440]	[2.4490]	[3.3497]	[3.3552]

Note: Model 1 is the Historical Average model; Model 2 is the model without control; Model 3 is the model with control and h = 24 represents the month 24 forecast horizon. The Clark & West test measures the significance of the difference between the forecast errors of two competing models. The null hypothesis of a zero coefficient is rejected if this statistic is greater than +1.282 (for a one sided 0.10 test), +1.645 (for a one sided 0.05 test) and +2.00 for 0.01 test (for a one sided 0.01 test) (see Clark and West, 2007). Values in square brackets – [ ] are t-statistics. a, b & c indicate statistical significance at 1%, 5% and 10% levels respectively. GPR is the composite geopolitical risk, GPRA is the geopolitical risk act and GPRT is the geopolitical risk threat.