Migration Letters

Volume: 21, No: S9 (2024), pp. 1112-1119

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)

www.migrationletters.com

Forecasting Economic Policy Uncertainty: A Geopolitical Risk Perspective

Hyder Ali[1], Suresh Kumar[1], Shah Rukh Hashmi[1], Ghulam Abbas[1], Muhammad Saleem Korejo[1*]

Abstract

This study investigates the predictive power of Geopolitical Risk (GPR) on Economic Policy Uncertainty (EPU) using an augmented Heterogeneous Autoregressive (HAR) model across multiple forecast horizons. Employing a comprehensive dataset spanning from April 1987 to December 2023, the research aims to enhance the understanding of EPU's determinants by incorporating the dynamic and often preceding nature of geopolitical tensions. By integrating GPR into the forecasting model, the study reveals that GPR contributes significant predictive content to the EPU, outperforming the baseline HAR model that excludes GPR. This is evidenced by the notable reduction in Mean Squared Forecast Error (MSFE) across all forecast horizons, indicating that GPR not only impacts EPU in the short term but may also have long-lasting effects. The Cumulative Difference of Squared Forecast Errors (CDSFE) analysis further highlights the model's outperformance, with positive and statistically significant R^2 *percentages ranging from 7.501% to 8.293% across the 1, 3, 6, and 12-month forecasting intervals. These findings highlight the importance of considering geopolitical factors in economic policy analyses and suggest that GPR can serve as an effective leading indicator for EPU. The implications of this study extend beyond the academic interest, providing practical insights for policymakers and investors seeking to mitigate risks associated with policy uncertainty. As geopolitical events continue to influence the global economic landscape, incorporating GPR into economic forecasting models could prove invaluable in strategic economic planning and decision-making processes.*

Keyword: *Economic policy uncertainty, Out-of-sample prediction, Geopolitical risk, Time Series Forecasting, Risk Management Analysis.*

1 Introduction

Understanding the intricate workings of global markets involves dealing with the concept of uncertainty, which holds a central position in modern economic discussions. Economic Policy Uncertainty (EPU) is particularly noteworthy among the array of uncertainties, given its significant impact on investment choices, market behavior, and government policymaking. The groundbreaking research by Baker et al. (2016) has reinforced EPU's importance, shedding light on its extensive influence on financial markets and economic results.

In addition to the conversation surrounding Economic Policy Uncertainty (EPU), there is a growing focus on Geopolitical Risk (GPR), which encompasses the economic

[1]Department of Business Administration, Sukkur IBA University, 65200 Sukkur, Sindh, Pakistan.

*Corresponding Author: *Email:* saleem.korejo@iba-suk.edu.pk

consequences of geopolitical occurrences. According to Caldara and Iacoviello (2022), GPR encompasses a spectrum of international threats, spanning from conflicts like war and terrorism to diplomatic strains that disrupt the economic landscape. The impacts of GPR go beyond immediate market turbulence, subtly affecting policy decisions and therefore, potentially shaping EPU.

The driving force behind this study is the intricate relationship between Geopolitical Risk (GPR) and Economic Policy Uncertainty (EPU). The underlying idea is that geopolitical tensions and conflicts often precede changes in policies, prompting governments to react in efforts to uphold economic stability or advance strategic objectives. This temporal connection implies that GPR could potentially act as a reliable leading indicator for EPU - an idea that has been somewhat overlooked but holds significant potential for improving our ability to predict economic uncertainty.

We chose the HAR-X model for our study because it is great at capturing the ongoing volatility in both EPU and GPR data. The work of Corsi (2009) on the HAR model, which deals with the complex volatility structure of financial markets, paved the way for us to bring in GPR as a factor for predicting EPU. What is special about the HAR-X model is its flexibility - it can handle monthly, quarterly, and annually components, which helps us capture the long-term patterns in EPU while tapping into the predictive power of GPR.

The study's main findings support the idea that Geopolitical Risk (GPR) has a strong predictive ability regarding Economic Policy Uncertainty (EPU). This not only aligns with the theories outlined by Colombo (2013), who found that variables external to market dynamics could offer powerful insights into future volatilities but also expands upon them by highlighting GPR's effectiveness in predicting policy uncertainty in a new context. These findings are quite convincing, suggesting that keeping an eye on geopolitical events can provide valuable insights into upcoming economic policy changes. It also highlights the interconnectedness of geopolitical events and economic policies, a nexus that has been hitherto underappreciated in the literature.

This research has far-reaching implications, connecting political science with economic forecasting. Its key contribution lies in proving that Geopolitical Risk (GPR) can reliably predict Economic Policy Uncertainty (EPU). This finding offers a valuable tool for economists, policymakers, and investors. It highlights the significant foresight provided by geopolitical tensions, potentially revolutionizing how we approach economic planning and risk management. In particular, the confirmation that Geopolitical Risk (GPR) serves as a leading indicator for Economic Policy Uncertainty (EPU) aligns with the insights of Brogaard and Detzel (2015). They emphasize the impact of geopolitical tensions on asset prices and economic volatility. Expanding on this, our study highlights how GPR not only predicts market movements but also foresees shifts in economic policy that often follow geopolitical disruptions. This revelation provides economists and policymakers with a fresh tool to refine economic planning. As Caldara and Iacoviello (2022) emphasize, incorporating Geopolitical Risk (GPR) into economic forecasting models could significantly enhance the ability to anticipate policy changes. This, in turn, enables more informed and proactive decision-making. Additionally, our research resonates with the findings of Azzimonti (2018), who demonstrates the quantitative connection between political conflict, partisanship, and economic outcomes. This further solidifies the role of GPR as a crucial economic indicator.

For investors, leveraging GPR to forecast EPU provides a competitive advantage, much like the benefits outlined by Colombo (2013). He illustrates how incorporating external predictors can enhance market volatility forecasting. Our research confirms that GPR can indeed be a potent tool for risk management, echoing the views of Pastor and Veronesi (2012), who emphasize the impact of political uncertainty on investment decisions. The study's contributions are particularly salient in the current global context, where geopolitical tensions frequently dictate the pace and direction of economic policies. By drawing attention to the inherent prescience in geopolitical developments, the research advocates for a paradigm shift in economic forecasting - one that not only contemplates market fundamentals but also proactively incorporates the signals emanating from the geopolitical arena.

Thus, this study fortifies the bridge between geopolitical analysis and economic policy forecasting, offering a methodologically rigorous and conceptually novel perspective that enriches the extant literature. It invites a reevaluation of existing economic models, advocating for the inclusion of GPR to enhance the precision of economic forecasting in an era where the global landscape is increasingly shaped by the shadow of geopolitical strife.

The following sections of this study are organized as follows. Section 2 provide information on the econometric framework. Section 3 presents the results. Finally, section 4 concludes.

2 Data and Econometric Framework

2.1 Data

In this study, we primarily rely on the US Economic Policy Uncertainty (EPU) index, developed by Baker et al. (2016), which has become a key measure for assessing fluctuations in policy-related economic uncertainty. We complement this measure with the US Geopolitical Risk (GPR) index, meticulously constructed by Caldara and Iacoviello (2022), serving as a monthly gauge of tensions and uncertainties in the global geopolitical landscape. Both indices provide a data spanning from April 1987 to December 2023, and their data is publicly available through the Policy Uncertainty website (https://www.policyuncertainty.com/).

The GPR index, specifically, distills information from various news sources to quantify the prevalence of geopolitical concerns. It encompasses the frequency of articles reporting on geopolitical tensions, encompassing a broad spectrum of events from military actions and geopolitical tensions to threats that impact national and international security.

Upon examining the uncertainty series through an augmented Dickey-Fuller test, we establish that both series exhibit unit roots, a common characteristic in economic time series that necessitates further transformation to achieve stationarity. To address this, we employ a log-difference transformation, consistent with Wang et al. (2015) and Gupta and Sun (2020), which refines the data into a stationary series representing the growth rates of uncertainty measures. This transformation not only aligns with the standard practices in time series analysis but also ensures the robustness of the subsequent econometric evaluation.

2.2 Econometric Framework

We follow Degiannakis and Filis (2019), who utilized an extended version of the the Heterogeneous Autoregressive (HAR) model called HAR-X to forecast Economic Policy Uncertainty (EPU) by incorporating data from exogenous variables.

$$\mathrm{EPU}_t = w_0 + w_1(\mathrm{EPU}_{t-1}) + w_2\left(3^{-1}\sum_{k=1}^{3}(\mathrm{EPU}_{t-k})\right) + w_3\left(12^{-1}\sum_{k=1}^{12}(\mathrm{EPU}_{t-k})\right) + w_4 GPR_{t-1} + \epsilon_t, \quad (1)$$

where EPU represents the log-difference of Economic Policy Uncertainty, while GPR denotes geopolitical risk, an exogenous variable such as changes in geopolitical risk. The error term ϵ_t captures residual variations. The suggested HAR-X model integrates information from the preceding month, quarter, and year regarding EPU_t, along with data on the given predictor, GPR in our case. The coefficients w are estimated using ordinary least squares (OLS). We divide the dataset (T) from May 1988 to December 2023 into two parts for out-of-sample forecasts: the initial 15 years (m = 180) from May 1988 to April 2003 for in-sample analysis, and the remaining S = 248 months from May 2003 to December 2023 for out-of-sample testing.[2] We employ a 15-year rolling window for out-of-sample forecasting to address potential model instability or structural breaks.

3 Empirical Results

We assess the forecasting performance of all models using the out-of-sample R_{oos}^2 metric proposed by Campbell and Thompson (2008), as defined in equation (2). This metric measures the percentage reduction in mean squared forecast error (MSFE) achieved by a given forecasting model using EPU_t compared to the benchmark, EPU_t^B, which represents a basic HAR model without any exogenous variables. A positive R_{oos}^2 value indicates that the model outperforms the benchmark. To determine if our model yields lower MSFE compared to the benchmark, we employ the statistic proposed by Clark and West (2007).

$$R_{oos}^2 = 1 - \frac{MSFE\left(\widehat{EPU}_t\right)}{MSFE\left(\widehat{EPU}_t^B\right)} = 1 - \frac{\sum_{t=m+1}^{T}\left(EPU_t - \widehat{EPU}_t\right)^2}{\sum_{t=m+1}^{T}\left(EPU_t - \widehat{EPU}_t^B\right)^2} \quad (2)$$

The empirical findings from the HAR [GPR] model are presented in Table 2 and highlight the forecasting power of GPR for EPU. With a focus on varying forecast horizons, we observe consistent predictive power, as reflected in the out-of-sample R^2 (%) values that represent a reduction in Mean Squared Forecast Error (MSFE) relative to the baseline HAR model without GPR. These robust values, coupled with the statistically significant MSFE-adjusted statistics, suggest that geopolitical tensions play a critical role in shaping economic policy landscapes, resonating with the seminal work by Baker et al. (2016) on the implications of EPU, and Caldara and Iacoviello (2022) on the measurable impact of geopolitical risks.

Table 1: Out-of-sample Forecasting Results, May 2003 to December 2023

	R_{OOS}^2(%)	MSFE-adjusted	p-value
HAR [GPR]			
Forecast Horizon			

[2] Although our original dataset spans April 1987 to December 2023 (441 months), the rate of change calculations and the 12 lags of our High-Frequency Autoregressive (HAR) model result in an effective period from May 1988 to December 2023.

h=1	8.051***	3.869	0.000
h=3	8.293***	3.836	0.000
h=6	7.819***	3.811	0.000
h=12	7.501***	3.779	0.000

Note: This table presents out-of-sample results for economic policy uncertainty. HAR [GPR] represents the results from model incorporating geopolitical risk (GPR), for different forecast horizons. MSFE denotes Mean Squared Forecast Error, while R_{oos}^2 indicates reduction in MSFE relative to the HAR model without any exogenous variable. To assess statistical significance of out-of-sample R_{oos}^2, we utilize the Clark and West (2007) statistic (MSFE-adjusted), testing the null hypothesis ($H_0 : R_{oos}^2 \leq 0$) against the one-sided alternative hypothesis ($H_A : R_{oos}^2 > 0$). Significance levels at 10%, 5%, and 1% are denoted by *, **, and ***, respectively.

The results point towards a robust and statistically significant relationship between geopolitical risk (GPR) and economic policy uncertainty (EPU), as forecasted using the Heterogeneous Autoregressive model (HAR) that includes GPR as an exogenous variable (HAR [GPR]). This model provides out-ofsample forecasting results spanning from May 2003 to December 2023. With a focus on different forecast horizons (h=1, h=3, h=6, and h=12 months), the results reveal that GPR has a consistent and significant predictive power for EPU, as evidenced by the positive values of R^2 (%). These values indicate the percentage reduction in Mean Squared Forecast Error (MSFE) when GPR is included in the model compared to a baseline HAR model without GPR. Notably, the R^2 (%) values range from 7.501% to

8.293%, demonstrating the considerable influence of GPR on EPU across all forecast horizons.

The MSFE-adjusted statistics, based on the Clark and West (2007) approach, further substantiate the predictive ability of the HAR [GPR] model. These statistics adjust for the potential overfitting that can occur in out-of-sample predictions. The fact that all MSFE-adjusted values are above zero and accompanied by p-values of 0.000 suggests that the addition of GPR into the forecasting model significantly improves the prediction of EPU, far beyond what could be attributed to chance. These findings integrate the pioneering concepts introduced by Baker et al. (2016), which underscore the pivotal role of EPU in the economic sphere, and Caldara and Iacoviello (2022), which measure and analyze the impact of geopolitical risks. The successful application of the HAR model, lauded for capturing the persistent structure of volatility in financial markets as demonstrated by Corsi (2009), suggests that the incorporation of GPR into EPU forecasts could be highly beneficial for economists and policymakers alike, providing them with a more nuanced and forward-looking approach to understanding and managing economic policy risks.

The detailed investigation of this study into the predictive relationship between GPR and EPU highlights the significance of geopolitical factors in economic forecasting and aligns with the broader call within the economic literature for models that can incorporate a variety of risk factors. These results contribute to a more comprehensive understanding of the drivers of EPU and offer a powerful tool for those seeking to anticipate and manage the economic implications of geopolitical developments.

We also use the Cumulative Difference of Squared Forecast Errors (CDSFE) to graphically demonstrate our models' predictive accuracy relative to the HAR benchmark over time. The CDSFE, computed based on S holdout out-of-sample observations, indexed by e = 1, 2, 3, ... S, can be expressed as:

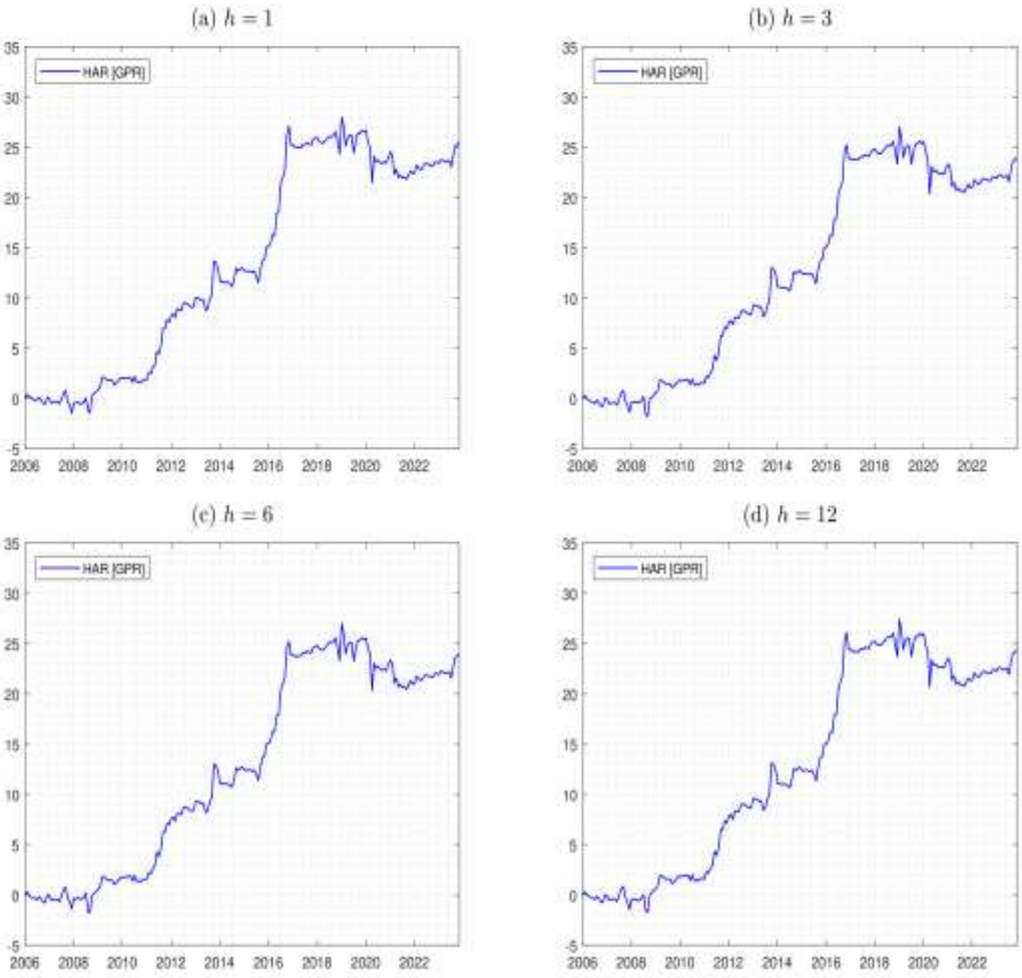
$$CDSFE = \sum_{s=1}^{e}\left(EPU_s - \widehat{EPU}_s^{B}\right)^2 - \sum_{s=1}^{e}\left(EPU_s - \widehat{EPU}_s\right)^2, \quad \forall\, e = 1, \ldots, S \qquad (3)$$

The graph presented in Figure 1, demonstrates the Cumulative Difference of Squared Forecast Errors (CDSFE) between a baseline Heterogeneous Autoregressive (HAR) model and an augmented version that incorporates Geopolitical Risk (HAR [GPR]). The analysis is conducted over a substantial period, stretching from May 2003 to December 2023, and encompasses four different forecast horizons: 1, 3, 6, and 12 months (denoted as h=1, h=3, h=6, and h=12 respectively). The individual panels (a) through (d) of Figure 1 reflect the evolution of this outperformance over time for each of the forecast horizons. Across all panels, the CDSFE trends upwards, suggesting that the inclusion of GPR in the HAR model consistently enhances the predictive accuracy for EPU over the baseline model. This is particularly notable during periods of significant geopolitical events that likely drive policy uncertainty, as captured by the spikes in the CDSFE trajectory. These spikes may correspond to known geopolitical incidents or tensions that would naturally contribute to EPU, thereby validating the predictive power of GPR within the model.

For the short-term forecast horizon (h=1), panel (a) shows a steady increase in CDSFE, implying that GPR offers immediate and valuable information that can improve short-term forecasts of EPU. As the forecast horizon extends, panels (b) (h=3) and (c) (h=6) display similar patterns, albeit with a slightly more pronounced variability, suggesting that while GPR remains a strong predictor, other factors might increasingly influence EPU as the forecasting period lengthens. In the longest forecast horizon shown in panel (d) (h=12), the upward trend in CDSFE persists, indicating that GPR's influence is sustained even over longer periods, albeit the predictive power appears to slightly diminish compared to shorter horizons. This could be indicative of the complex interplay between immediate geopolitical events and the longer-term economic policy responses they elicit.

In summary, the analysis indicates that geopolitical risk not only affects economic policy uncertainty in the short run but also has a lasting impact on future uncertainty. This evidence aligns with the work of Baker et al. (2016) on measuring EPU, and the geopolitical risk assessment by Caldara and Iacoviello (2022), both of which highlight the interconnections between geopolitics and economic policy. Furthermore, the predictive strength of the HAR [GPR] model reinforces the findings from Corsi (2009) regarding the HAR model's efficacy, extending its application to the domain of economic policy forecasting, as suggested by Clark and West (2007) for statistical validation of forecast performance.

Figure 1: CDSFE Analysis - Different Forecast Horizons



Note: This graph illustrates the Cumulative Difference of Squared Forecast Errors (CDSFE) between the HAR model and the HAR-X models being assessed across the out-of-sample period, which extends from May 2003 to December 2023.

3.1 Robustness Analysis

We enhance the robustness of our analysis through several approaches. These include employing an expanding window and rolling window with lengths of 5, 10, and 20 years, investigating various sample split-dates, exploring sub-samples with different starting and ending dates, and conducting simulations to reinforce the robustness of our findings. This thorough examination consistently validates our main results, underscoring their reliability.[3]

4 Conclusion

We assessed the predictability of economic policy uncertainty (EPU) by incorporating changes in geopolitical risk (GPR). The HAR-X model, integrating GPR, significantly outperforms the HAR benchmark. This affirms the predictive power of Geopolitical Risk (GPR) for Economic Policy Uncertainty (EPU). By innovatively applying the Heterogeneous Autoregressive model augmented with GPR (HAR [GPR]), our research unveils a statistically significant relationship across various forecasting horizons, as evidenced by the out-of-sample R^2 values and MSFE-adjusted statistics.

[3] For brevity, robustness results are omitted here but are available upon request.

The robustness of our findings holds particular significance for a diverse range of stakeholders navigating the unpredictable currents of the global economic landscape. For policymakers, our model offers valuable guidance in crafting resilient, forward-thinking policies capable of withstanding geopolitical turbulence. Likewise, for investors and businesses, the enhanced predictive capability prompts a reassessment of risk management strategies to prepare for the potential impacts of EPU disruptions. We contend that our paper makes a pivotal contribution to the literature, paving the way for further exploration into the predictive dynamics of risk factors and economic policy formulation. As we stand on the cusp of a dynamic geopolitical era, the intersection of political science and economic forecasting presents rich opportunities for scholarly inquiry and practical application alike.

References

Azzimonti, M. (2018). Partisan conflict and private investment. Journal of Monetary Economics, 93:114– 131.

Baker, S. R., Bloom, N., and Davis, S. J. (2016). Measuring economic policy uncertainty. The Quarterly Journal of Economics, 131(4):1593–1636.

Brogaard, J. and Detzel, A. (2015). The asset-pricing implications of government economic policy uncertainty. Management Science, 61(1):3–18.

Caldara, D. and Iacoviello, M. (2022). Measuring geopolitical risk. American Economic Review, 112(4):1194–1225.

Campbell, J. Y. and Thompson, S. B. (2008). Predicting excess stock returns out of sample: Can anything beat the historical average? The Review of Financial Studies, 21(4):1509–1531.

Clark, T. E. and West, K. D. (2007). Approximately normal tests for equal predictive accuracy in nested models. Journal of Econometrics, 138(1):291–311.

Colombo, V. (2013). Economic policy uncertainty in the us: Does it matter for the euro area? Economics Letters, 121(1):39–42.

Corsi, F. (2009). A simple approximate long-memory model of realized volatility. Journal of Financial Econometrics, 7(2):174–196.

Degiannakis, S. and Filis, G. (2019). Forecasting european economic policy uncertainty. Scottish Journal of Political Economy, 66(1):94–114.

Gupta, R. and Sun, X. (2020). Forecasting economic policy uncertainty of bric countries using bayesian vars. Economics Letters, 186:108677.

Pastor, L. and Veronesi, P. (2012). Uncertainty about government policy and stock prices. The Journal of Finance, 67(4):1219–1264.

Wang, Y., Zhang, B., Diao, X., and Wu, C. (2015). Commodity price changes and the predictability of economic policy uncertainty. Economics Letters, 127:39–42.