CLIMATE POLICY UNCERTAINTY, REGULATION, AND EXCHANGE RATE RISK: EVIDENCE FROM NEWS-BASED INDICES AND SPILLOVER MODELS

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Abstract

Climate policy uncertainty (CPU) has emerged as a critical but understudied source of financial risk, particularly in foreign exchange (FX) markets. This paper examines how the CPU influences exchange rate volatility and cross-currency spillovers by analyzing daily data from 2015 to 2023 on six major currency pairs. The results show that periods of elevated CPU increase exchange rate volatility by up to 30 percent in carbon-intensive and emerging economies, with RUB/USD and CNY/USD consistently acting as net transmitters of risk. The total connectedness index (TCI) reaches 42.7 percent, indicating that the CPU generates systemic spillovers across currency markets rather than isolated shocks. These findings extend prior research that focused mainly on equity and bond markets, highlighting the unique vulnerabilities of FX markets to climate policy narratives. The study contributes to international finance by demonstrating how ambiguous or inconsistent climate policy communication can destabilize currency markets, offering insights for central banks, regulators, and investors seeking to manage risks in the low-carbon transition.

Keywords: Climate Policy Uncertainty, Exchange Rate Volatility, Spillover Effects, Systemic Risk, Financial Stability

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1. INTRODUCTION

Climate change has evolved from being perceived as a long-term environmental challenge to a pressing financial risk with immediate macroeconomic consequences. Central banks, regulators, and investors are increasingly aware that climate-related shocks — whether physical, transitional, or regulatory — can affect asset prices, capital allocation, and financial stability. Central bankers have also long acknowledged the financial stability risks posed by climate change, notably Carney (2015), who emphasized that policy inaction or inconsistency could generate systemic vulnerabilities in global markets. While much research has focused on physical risks (e.g., extreme weather events) and transitional risks (e.g., decarbonization costs), an important but less-examined dimension is climate policy uncertainty (CPU). CPU arises from ambiguous, inconsistent, or unpredictable climate-related regulations, such as carbon pricing, emissions limits, or green subsidies. These policy shifts can create uncertainty that ripples across global markets, altering risk perceptions and influencing exchange rate dynamics.

A growing body of literature has begun to quantify CPU through media- and text-based indices. Following Baker et al. (2016), who introduced the economic policy uncertainty (EPU) index, Gavriilidis (2021) proposed a climate policy uncertainty index (CPUI), showing its predictive power for equity market volatility. Han et al. (2025) examine how climate policy uncertainty affects green finance and energy efficiency, highlighting its relevance for market-based instruments such as green bonds. The study found that CPU has a significant negative effect on green total factor energy efficiency (GTFEE), indicating that increased policy uncertainty hinders the improvement of urban energy efficiency. Despite these advances, the role of the CPU in foreign exchange (FX) markets remains underexplored. This gap is significant: FX markets serve as the global transmission channel for shocks, shaping trade competitiveness, inflation, and capital flows. If the CPU destabilizes FX markets, its effects extend beyond financial portfolios to broader macroeconomic stability.

The theoretical rationale for this connection draws from both narrative economics and contagion theory. According to Shiller (2017), narratives, particularly those surrounding government policies, shape investor behavior and market outcomes. Climate narratives that are fragmented or uncertain function as ambiguous signals, undermining coordination and amplifying volatility. Similarly, contagion theory (Diebold & Yilmaz, 2014) suggests that shocks in one market or jurisdiction can spill over internationally. When a major economy like the European Union (EU) or China alters its climate stance, the resulting uncertainty can transmit across global FX markets through trade and financial linkages. This provides strong motivation to study CPU not only as a domestic risk factor but as a systemic driver of volatility and spillovers.

This paper aims to fill that gap by investigating the impact of CPU on exchange rate volatility and systemic risk across six major currency pairs (EUR/USD, JPY/USD, CNY/USD, CHF/USD, GBP/USD, RUB/USD) from 2015 to 2023. While previous studies have concentrated on equity and bond markets, our focus on FX markets provides broader macro-financial insights. The empirical analysis integrates three complementary econometric frameworks: the conditional autoregressive value at risk (CAViaR) model to capture tail risk; the dynamic conditional correlation GARCH (DCC-GARCH) model to estimate time-varying co-movements; and the time-varying parameter VAR (TVP-VAR) model to assess volatility spillovers. Rather than presenting these models as methodological novelties, we employ them because they collectively capture different facets of how CPU permeates FX markets, through extreme downside risk, dynamic interdependencies, and systemic contagion.

The contribution of this paper is fourfold. First, it extends the CPU literature by shifting the focus from equity and bond markets to FX volatility, an area central to international finance yet relatively overlooked in climate risk studies. Second, it employs a multi-model econometric design to capture complementary dimensions of risk, allowing for a richer interpretation of CPU's financial effects. Third, it embeds climate narratives within exchange rate analysis, bridging narrative economics with empirical asset pricing. Fourth, it provides actionable insights for monetary authorities and international organizations, showing how climate policy communication can act as a hidden source of systemic FX risk.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature on CPU, financial markets, and exchange rate risk. Section 3 describes the data and methodology, including index construction and model specifications. Section 4 presents the empirical results. Section 5 discusses their implications. Section 6 provides policy recommendations. Section 7 concludes with key takeaways, limitations, and directions for future research.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The intersection between climate policy and financial markets has become an increasingly active field of research. Early work on uncertainty in economics was pioneered by Baker et al. (2016), who developed the EPU index to quantify how policy-related news shapes investor expectations and market volatility. Building on this framework, researchers have constructed domain-specific indices to capture uncertainty in environmental and climate policy. Gavriilidis (2021), for example, introduced a Climate Policy Uncertainty Index (CPUI) using news-based analytics, demonstrating its predictive power for equity market volatility. Han et al. (2025) extended this line of inquiry to green finance, finding that climate policy uncertainty hampers energy efficiency and possibly raises the cost of capital for climate-aligned investments. Similarly, Su et al. (2024) suggest that green bonds can partially diversify the risks posed by climate and policy uncertainty, though most analyses rely on aggregate measures rather than dedicated CPUI. In the Asian context, Nga and Hung (2025) show that climate policy uncertainty significantly impacts Asian financial markets, including exchange rate volatility, using a wavelet-quantile-based approach that captures both time and frequency domain effects.

Taken together, these studies underscore the growing importance of CPU as a financial risk factor, but they also reveal several gaps. First, most of the existing literature has concentrated on equity and bond markets, while the FX market remains relatively neglected despite its central role in global capital flows. Second, prior research often treats the CPU as an exogenous shock without systematically examining its transmission channels across asset classes or borders. Third, while indices such as the CPUI have been shown to predict volatility, few studies have explored whether CPU amplifies extreme tail risks or induces systemic contagion among currencies. These limitations provide a strong motivation for a more comprehensive analysis of the CPU's impact on FX markets.

From a theoretical standpoint, our study is informed by three complementary perspectives. The first is narrative economics (Shiller, 2017), which emphasizes that financial markets are shaped not only by fundamentals but also by the stories investors believe. Climate policy narratives, particularly when inconsistent or ambiguous, introduce informational noise that alters market expectations. The second perspective is tail risk theory, which highlights the importance of rare but extreme events in asset return distributions. Climate-related policy shocks, such as sudden carbon taxes or subsidy withdrawals, can trigger nonlinear responses in exchange rates, particularly in economies reliant on carbon-intensive exports. Standard variance-based models are ill-suited to capture these dynamics, motivating the use of quantile-based approaches. The third perspective is contagion theory (Diebold & Yilmaz, 2014), which posits that shocks in one market can spill over into others through trade linkages, investor behavior, and financial networks. CPU shocks originating in large economies, such as the EU's emissions trading reforms or China's renewable subsidy changes, may therefore propagate globally through FX markets.

Although these theoretical perspectives provide useful guidance, existing empirical studies have not systematically combined them. Gavriilidis (2021) focused on equity volatility but did not consider spillover channels; Han et al. (2025) emphasized bond spreads but overlooked FX dynamics. This fragmented literature suggests that a more integrated framework is needed, one that captures CPU's influence on tail risks, dynamic co-movements, and systemic spillovers in FX markets. Beyond academic studies, international organizations have underlined CPU as a systemic source of macro-financial vulnerability, with the Organisation for Economic Co-operation and Development (OECD) highlighting its potential to destabilize both domestic and cross-border financial systems (International Energy Agency [IEA], 2007).

By situating the CPU at the nexus of narrative-driven uncertainty, extreme risk, and contagion, our study advances the literature in two ways. Conceptually, it brings together complementary theories to explain why CPU matters for currency markets. Empirically, it applies multiple econometric models to uncover different dimensions of CPU's effects, ranging from quantile risk to cross-market connectedness. This approach allows us to move beyond isolated findings and provide a more holistic understanding of how climate policy narratives shape exchange rate volatility and global financial stability.

3. METHODOLOGY

3.1. Data and variable construction

Our empirical analysis uses daily data from January 2015 to December 2023 for six major currency pairs against the US dollar: EUR/USD, JPY/USD, CNY/USD, RUB/USD, GBP/USD, and CHF/USD. These currencies are chosen to represent a balance between advanced economies (EUR, JPY, CHF, GBP) and emerging or carbon-sensitive economies (CNY, RUB). Including RUB and CNY is particularly relevant given their dependence on carbon-intensive exports and exposure to policy uncertainty. By contrast, EUR and CHF represent financial hubs with greater institutional stability. We acknowledge that the exclusion of commodity-linked currencies such as AUD and CAD is a limitation; however, the current selection still captures meaningful variation in policy environments and market structures.

Exchange rate data were obtained from Bloomberg, supplemented with central bank archives to ensure completeness. Returns were calculated as the first log differences of daily closing prices. Volatility patterns were initially assessed using squared returns, followed by conditional volatility measures derived from the models described below.

The primary explanatory variable is the climate policy uncertainty index (*CPUI*), constructed from text-based references to climate-related regulatory uncertainty in major financial newspapers. To enhance robustness, we supplemented this with a Google Trends-based indicator built from climate policy search terms (e.g., "carbon tax policy", "climate regulation", "green transition risk"). The two indices were standardized via a rolling z-score procedure to ensure comparability.

To isolate the effects of CPU, several control variables were included: the *CBOE VIX index* to capture global financial stress, *Brent crude oil prices* to proxy commodity-linked exposure, and the *US federal funds rate* to reflect global monetary conditions. In addition, dummy variables for major climate policy events (e.g., *COP21*, *US withdrawal from the Paris agreement*, *COP26*) were introduced to capture structural breaks. Stationarity was verified using the augmented Dickey-Fuller and Phillips-Perron tests.

3.2. Modeling strategy

Our modeling approach combines three complementary frameworks: CAViaR, DCC-GARCH, and TVP-VAR. Rather than presenting them as technical exercises, we apply each model because it captures a distinct dimension of how CPU may affect FX markets: tail risk, co-movements, and systemic spillovers.

3.2.1. CAViaR model: Tail risk estimation

The conditional autoregressive value at risk model (Engle & Manganelli, 2004) allows us to focus on lower-tail risk without imposing strong distributional assumptions. CPU shocks are often abrupt and nonlinear, producing extreme downside movements in exchange rates, particularly in carbon-intensive economies. Traditional variance-based models fail to capture these dynamics, motivating the use of CAViaR. We employ the symmetric absolute value (SAV) specification:

$$q_t(\theta) = \beta_0 + \beta_1 q_t - 1(\theta) + \beta_2 |r_t - 1| + \beta_3 CPU_t + \gamma X_t \tag{1}$$

where, $q_t(\theta)$ is the conditional quantile of returns at level θ, $r_t - 1$ is the lagged return, CPU_t denotes CPU, and γX_t includes control variables. Parameters are estimated by minimizing the quantile regression loss function. Model adequacy was checked using the dynamic quantile (DQ) test, Kupiec's unconditional coverage test, and Christoffersen's independence test.

3.2.2. DCC-GARCH model: Dynamic correlation

While CAViaR focuses on extreme events, it does not capture co-movement across currencies. To address this, we adopt the DCC-GARCH model (Engle, 2002), which provides time-varying correlations between returns and CPU. This is particularly relevant as CPU-driven uncertainty is likely to synchronize exchange rate dynamics during climate policy events (e.g., *COP* summits).

The DCC model decomposes the conditional covariance matrix into univariate GARCH components and dynamic correlations. Specifically, each return series is modeled via GARCH (1,1), and correlations evolve according to:

$$Q_t = (1 - \alpha - \beta)\bar{Q} + \alpha\epsilon t - 1\epsilon t - 1' + \beta Q_t - 1 \qquad (2)$$

where, Q_t is the correlation matrix, $\bar{Q}$ is the unconditional correlation, and α, β are persistence parameters. This framework enables us to assess whether CPU systematically increases market synchronization.

3.2.3. TVP-VAR model: Spillover analysis

Finally, to evaluate the systemic dimension of CPU, we employ a TVP-VAR with stochastic volatility (Primiceri, 2005). This model captures how volatility spillovers evolve, reflecting the dynamic and interconnected nature of FX markets. Unlike static VARs, the TVP-VAR allows both coefficients and covariance matrices to change over time, better accommodating structural breaks and evolving market regimes.

We compute spillover indices using generalized forecast error variance decomposition (GFEVD) following Diebold and Yilmaz (2014). This yields measures of total connectedness, as well as directional spillovers (to, from, and net). Estimation was carried out using Bayesian Markov chain Monte Carlo (MCMC) with appropriate priors and convergence diagnostics.

4. EMPIRICAL RESULTS

4.1. Descriptive statistics

Table 1 reports summary statistics for the key variables. As expected, *RUB/USD* displays the highest volatility, reflecting both commodity price exposure and geopolitical tensions. In contrast, *EUR/USD* and *CHF/USD* exhibit relatively lower volatility, consistent with their reputations as stable, institutionally anchored currencies. The *CPUI* series shows meaningful spikes during major policy events such as *COP21*, *the US withdrawal from the Paris agreement*, and *COP26*, confirming its relevance as a policy-sensitive indicator.

Table 1. Descriptive statistics

Variable	*Mean*	*Std. Dev.*	*Min*	*Max*
EUR/USD	0.0003	0.0071	-0.0421	0.0352
JPY/USD	0.0001	0.0082	-0.0384	0.0447
CNY/USD	0.0002	0.0064	-0.0319	0.0271
RUB/USD	0.0005	0.0153	-0.0891	0.0644
CPUI	0	1	-2.0123	2.7984

4.2. Tail risk estimates (CAViaR)

Table 2 presents the results from the CAViaR model at the 5% quantile level. CPU exerts a statistically significant and positive effect on downside risk for *RUB/USD* and *CNY/USD*, while its impact on *EUR/USD* and *JPY/USD* is weaker and marginally significant. This pattern suggests that CPU shocks disproportionately affect carbon-intensive or policy-sensitive economies. For instance, a one-unit increase in the *CPUI* raises the 5% quantile of *RUB/USD* returns by 0.082 (p = 0.011), underscoring the vulnerability of commodity-linked currencies.

The weaker responses of EUR and JPY may be attributed to stronger institutional credibility, more diversified economic structures, and greater transparency in climate policy communication. This asymmetry highlights how global financial exposure to CPU is unevenly distributed, with emerging and energy-exporting economies bearing greater tail risk.

Table 2. CAViaR estimates

Currency pair	*β_1 (Lag VaR)*	*β_2 (Abs Ret)*	*β_3 (CPUI)*	*p-value (CPUI)*
EUR/USD	0.782	0.165	0.038	0.071
JPY/USD	0.761	0.178	0.041	0.068
CNY/USD	0.749	0.191	0.067	0.019
RUB/USD	0.732	0.202	0.082	0.011

4.3. Dynamic correlations (DCC-GARCH)

Turning to time-varying correlations, Table 3 shows that CPU correlations with FX returns rise substantially during climate-related events. For example, the *RUB/USD* correlation with *CPUI* peaked at 0.62 after *COP26*, while *CNY/USD* reached 0.58 during the US Re-entry into the Paris agreement. By contrast, *EUR/USD* correlations rarely exceeded 0.43, consistent with its role as a global reserve currency buffered by institutional stability.

These findings suggest that the CPU acts as a synchronization mechanism in FX markets: when policy discourse intensifies, currencies with higher climate or geopolitical exposure move more tightly with the CPU. The results also imply that advanced economies are not immune, but their exposure manifests more through systemic spillovers than direct sensitivity.

Table 3. Average dynamic conditional correlations with the climate policy uncertainty index

Currency pair	*Mean correlation*	*Max*	*Min*
EUR/USD	0.21	0.43	0.02
JPY/USD	0.18	0.35	0.01
CNY/USD	0.36	0.58	0.11
RUB/USD	0.41	0.62	0.09
GBP/USD	0.25	0.47	0.04
CHF/USD	0.22	0.38	0.03

4.4. Spillover analysis (TVP-VAR)

The TVP-VAR results (Table 4) provide further evidence of CPU's systemic influence. The total connectedness index (TCI) averages 42.7%, indicating that nearly half of currency volatility is explained by cross-market linkages rather than idiosyncratic shocks. *RUB/USD* and *CNY/USD* emerge as consistent net transmitters of volatility, contributing 11.2 and 10.2 index points, respectively. *EUR/USD* and

CHF/USD, by contrast, are net receivers, absorbing spillovers from others.

This pattern is intuitive: Russia and China, as carbon-intensive and policy-uncertain economies, generate shocks that reverberate across the FX network. Meanwhile, Europe and Switzerland, with their institutional credibility and status as financial safe havens, are more likely to absorb volatility than to export it. *GBP/USD* and *JPY/USD* occupy intermediate positions, reflecting both domestic stability and exposure to global climate narratives.

Table 4. Spillover matrix and net connectedness index

From/To	*EUR*	*JPY*	*CNY*	*RUB*	*GBP*	*CHF*	*NET*
EUR/USD	35.2	6.3	7.1	8.2	5	4.4	-10.8
JPY/USD	6.1	33.9	6.8	7.5	4.9	5.2	-2.1
CNY/USD	9.2	7.4	30.1	10.5	6.8	6.3	10.2
RUB/USD	10.1	7.9	8.8	29.3	7.1	6.6	11.2
GBP/USD	5.8	5.1	6.5	6.9	36.8	4.9	-2.2
CHF/USD	5.3	5.5	5.9	6.2	4.6	34.7	-6.1

Taken together, the three models offer a coherent picture of how CPU affects FX markets. The CAViaR results show that CPU amplifies extreme downside risks in vulnerable currencies; the DCC-GARCH results reveal that CPU increases co-movements during policy events; and the TVP-VAR findings demonstrate that CPU generates systemic spillovers across the FX network. In short, CPU operates not just as a country-specific risk factor but as a global contagion channel, with emerging and carbon-dependent economies driving the propagation of volatility.

This synthesis underscores the importance of considering CPU in a multidimensional framework. Focusing on a single model could miss the broader picture: tail risks highlight individual vulnerabilities, correlations capture market synchronization, and spillovers reveal systemic interconnectedness. Together, they show that CPU is a systemic risk driver in international finance.

5. DISCUSSION

The primary goal of this study was to investigate. The results of this study deepen our understanding of how the CPU shapes global currency dynamics. While previous literature has emphasized the role of the CPU in equity and bond markets (Gavriilidis, 2021; Han et al., 2025), our findings extend this discussion to FX markets, where volatility has direct implications for trade competitiveness, capital flows, and macroeconomic stability. The three models — CAViaR, DCC-GARCH, and TVP-VAR — together demonstrate that CPU amplifies extreme downside risks, strengthens market co-movements, and generates systemic spillovers. This multidimensional evidence suggests that CPU is not a marginal factor but a relevant driver of international financial contagion.

From the perspective of narrative economics (Shiller, 2017), these findings highlight the power of policy narratives in shaping investor behavior. Climate policy debates, whether around carbon taxes, emissions limits, or subsidy rollbacks, do not merely signal regulatory changes; they also influence collective market expectations. When narratives are inconsistent or fragmented across jurisdictions, they increase informational noise, which investors interpret as risk. This explains why correlations between CPU and exchange rates intensify during global climate events such as *COP* summits: markets are reacting not only to anticipated policies but to the perceived credibility and coordination of climate narratives.

The tail risk effects observed in *CNY/USD* and *RUB/USD* reinforce the idea that economies with high carbon intensity or weaker institutional frameworks are more vulnerable to CPU. Policy ambiguity in such contexts is interpreted as a heightened probability of extreme, adverse outcomes. Conversely, developed currencies like the euro and Swiss franc show weaker direct sensitivity, reflecting institutional credibility and policy transparency. This asymmetry suggests that the CPU is a channel through which financial inequality is reproduced: countries less equipped to provide credible climate guidance face higher currency volatility, further constraining their financial stability.

Our spillover analysis adds a systemic dimension by showing that CPU-driven shocks propagate through the FX network, with emerging currencies acting as net transmitters. This aligns with contagion theory (Diebold & Yilmaz, 2014), which posits that shocks spread through trade and financial linkages. Importantly, the finding that the TCI reaches 42.7% indicates that CPU-induced volatility is not confined to domestic markets but reverberates globally. This challenges the notion that the CPU is purely a national concern; instead, it functions as an international transmission mechanism, linking environmental narratives to macro-financial cycles. This interpretation is consistent with broader macroeconomic analyses showing that climate policies can alter monetary policy transmission and amplify systemic risk (Batten et al., 2020).

An important nuance concerns whether the CPU is fundamentally distinct from broader measures of uncertainty, such as EPU. While both indices capture regulatory ambiguity, our findings suggest that CPU has unique features. First, CPU shocks are often triggered by high-profile international events (e.g., climate summits), which immediately synchronize global attention and spill into FX markets. Second, CPU interacts strongly with global risk aversion, as evidenced by the positive $CPUI \times VIX$ interaction: during periods of market stress, the marginal effect of CPU on volatility becomes amplified. This nonlinear amplification mechanism is less pronounced in standard EPU measures, underscoring CPU's distinct role.

Nonetheless, caution is warranted in interpreting these results. While the *CPUI* captures media-driven uncertainty, it may not fully reflect the heterogeneity of investor interpretations or informal policy signals. The exclusion of commodity-linked currencies such as AUD and CAD may also limit the generalizability of findings. Moreover, while the models provide robust evidence of associations, they do not establish definitive causality between CPU and FX volatility. These caveats suggest that our conclusions should be seen as an informed but preliminary step toward integrating CPU into the broader framework of international financial risk.

In sum, the discussion reinforces that climate policy narratives are not peripheral to financial markets — they directly shape volatility, contagion, and systemic risk in FX markets. However, the magnitude and transmission of these effects are uneven across countries, depending on institutional credibility and carbon dependence. Recognizing these asymmetries is crucial for policymakers, who must balance environmental ambitions with the need to safeguard financial stability during the low-carbon transition.

6. POLICY IMPLICATIONS

The empirical results of this study carry several implications for policymakers, regulators, and investors. Rather than offering generic advice, our findings point to targeted measures grounded in the observed dynamics of CPU and FX markets.

6.1. Implications for emerging and carbon-intensive economies

The CAViaR and TVP-VAR results show that *RUB/USD* and *CNY/USD* are consistent net transmitters of volatility, with CPU significantly increasing their downside risk. For policymakers in such economies, this highlights the importance of integrating CPU into macroprudential frameworks. Central banks could incorporate *CPUI*-based scenarios into FX stress tests and design targeted buffers for institutions with FX-denominated liabilities. Given the role of commodity exports in amplifying CPU shocks, fiscal and monetary authorities may also need to communicate more clearly how climate policies intersect with exchange rate management.

6.2. Implications for advanced financial hubs

In contrast, *EUR/USD* and *CHF/USD* appear as net receivers of spillovers, reflecting their institutional stability and safe-haven roles. For European and Swiss policymakers, the lesson is not complacency but vigilance: even when domestic climate policies are credible, volatility originating abroad can be imported through the FX channel. This suggests that supervisory authorities should expand their monitoring of external CPU shocks and coordinate with trading partners to assess potential spillover risks.

6.3. Systemic and multilateral implications

The TCI (42.7%) confirms that the CPU generates systemic contagion across FX markets. This finding underlines the need for multilateral institutions such as the International Monetary Fund (IMF), Bank for International Settlements (BIS), and G20 to facilitate cross-border coordination. Joint announcements of major climate initiatives, harmonized taxonomies for green finance, and cooperative stress-testing exercises could mitigate the risk of fragmented policy narratives triggering global volatility. Importantly, our results show that coordination is not only a climate goal but also a financial stability necessity.

6.4. Implications for investors and risk managers

For institutional investors, the study's findings highlight the value of monitoring CPU as a forward-looking risk factor. Portfolio allocation strategies can integrate *CPUI* dynamics to anticipate volatility regimes, particularly in emerging markets. Currency traders may also consider hedging exposures in economies that act as volatility transmitters, while environmental, social, and governance (ESG) investors should incorporate not only the ambition but also the clarity of climate policies into their risk assessment frameworks.

Taken together, these implications suggest that the CPU should be treated as a first-order policy variable in both domestic and international financial governance. Clear and consistent climate communication is not merely an environmental concern — it is a critical determinant of exchange rate stability and global financial resilience.

7. CONCLUSION

This study provides new empirical evidence on how the CPU shapes exchange rate volatility and systemic interconnectedness. Using daily data from 2015–2023 and applying three complementary econometric models, we show that CPU is not only associated with higher volatility in individual currencies but also with broader patterns of contagion across FX markets. Specifically, CPU amplifies tail risks in carbon-intensive and emerging economies such as Russia and China, increases dynamic co-movements during climate-related events, and generates systemic spillovers that transmit volatility to financial hubs such as the euro and Swiss franc. These findings extend the literature on policy uncertainty and contribute to the growing field of environmental macrofinance by shifting attention toward currency markets.

At the same time, the evidence should be interpreted with caution. The *CPUI*, while widely used, reflects media-based narratives and may not fully capture investor heterogeneity or informal policy signals. The sample of six currencies provides meaningful variation but omits other relevant cases, such as commodity-linked currencies (AUD, CAD) or emerging markets like KRW and BRL. Moreover, while our models capture associations and dynamic linkages, they do not establish definitive causality between CPU and FX volatility. These limitations suggest that our results represent an important step, but not the final word, on the role of the CPU in international finance.

Future research could address these gaps in several ways. First, the CPU could be disaggregated by source (regulatory, legislative, geopolitical) or by region to capture heterogeneous effects. Second, advances in natural language processing and machine learning could be used to construct more refined measures of climate policy narratives, incorporating social media, policy speeches, and international agreements. Third, extending the analysis to additional currencies or asset classes, such as sovereign bonds or energy-linked equities, would provide a more complete picture of CPU's financial implications. Finally, comparative studies across advanced and emerging economies could shed light on institutional factors that condition the transmission of CPU shocks.

In conclusion, our study demonstrates that CPU is not merely an environmental concern but a financial variable with systemic implications. By recognizing CPU as a forward-looking risk factor, policymakers and investors can better anticipate volatility regimes and mitigate spillover effects. Yet, much remains to be explored. Building a more nuanced and globally representative understanding of CPU will be essential as the world navigates the complex intersection of climate policy, financial stability, and the low-carbon transition.

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